JANUARY, 1957

B 631660

PIPE LINE INDUSTRY

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CONSTRUCTION • OPERATIONS • MAINTENANCE

B 631660

57 OUTLOOK

20% Hike in U. S. Construction

. . . p. 22

NEW METHODS

These Ideas Aided Pipeliners in '56

. . . p. 26

FASTER CONSTRUCTION

How Trans-Canada Whips the Weather

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BETTER DESIGN

Answers to 3-Phase Flow Problems

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CLOSER COMMUNICATIONS

2-Way Radio Keeps Spread Moving

. . p. 48

For a "Quick Look" at this issue, turn the page .

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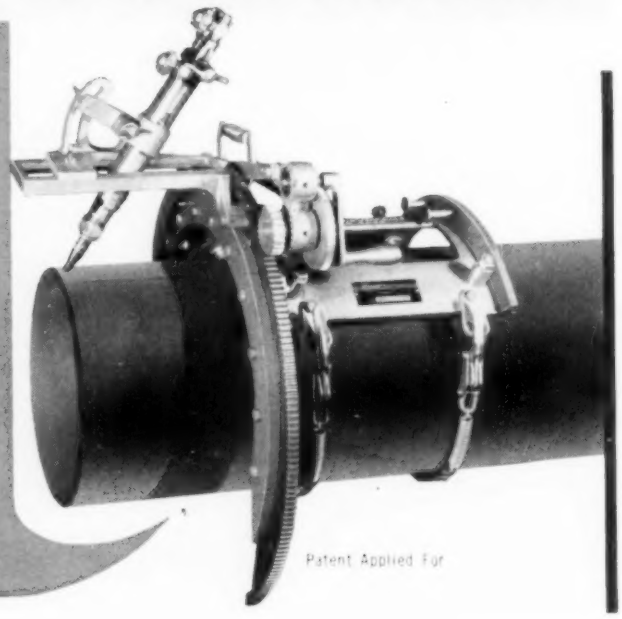

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PIPE LINE INDUSTRY

CONTENTS and Quick Look

January, 1957 Vol. 6, No. 1

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

Suez Crisis Puts Pressure on U. S. Pipe Lines

☐ Despite some obvious shortcomings, the U. S. oil industry is doing a tremendous job of meeting the challenge presented by Western Europe's urgent need for oil. In this exclusive PIPE LINE INDUSTRY report you will find a complete analysis of the problems involved in moving enough crude to the Gulf Coast to meet the phenomenal rise in export demand—the plan for routing crude to the Gulf and to Europe—actions taken by pipe line companies to meet the emergency—plus, the latest Department of Interior figures on pipe line capacity, ultimate goals for crude movement and oil shipments from the Gulf to the East Coast and Western Europe. Read the full report beginning on.....Page 20

Big Construction Increase Forecast for '57

☐ The coming year may well be a record one in pipe line construction around the world. PIPE LINE INDUSTRY's annual industry survey forecasts 16,850 miles of new gas, oil and products lines during 1957. Installation of compressor and pumping horsepower totaling 555,790 is also predicted.

By Melvin A. Judah.....Page 22

Pipe Line Contractors Converge on Florida

☐ Pipe Line construction leaders convene January 13-16 in Boca Raton, Fla., to review the outstanding developments that have marked pipe line progress. A packed program covers special regulatory problems of the industry, a look at Trans-Canada construction, prospects for slurry lines, and safety practices.....Page 24

Pipe Line Progress in 1956 Points Way for Future

☐ New ideas made construction records possible on some of the toughest pipe line jobs completed last year. These coupled with revolutionary advancements in pipe line operations promise interesting prospects for 1957.

By Melvin A. Judah.....Page 26

U. S. Contractors Conquer Spanish Terrain

☐ U. S. and Spanish contractors teamed up to lick mud and granite on a 481-mile jet fuel line. This new line connects seven key Strategic Air Command bases in Spain. Its unusual design features give high operating dependability.

By Omer Anderson.....Page 34

Right-of-Way Problems Are Everybody's Business

☐ Here is an objective look at the problems pipe line engineers and land departments meet in acquiring right-of-way for cross-country lines. Applying these ideas can lead to "tailor made" policies to fit specific needs.

By F. A. Smith.....Page 36

Trans-Canada Line Moves Eastward

☐ Work is now well underway on the 34-inch western section of this 2250-mile line to carry Alberta gas to eastern Canada. Contractors have met and overcome tough problems of pipe supply and winter weather to lay as much as two miles of the big pipe per day...Page 41

Calculating 3-Phase Flow in Horizontal Lines

☐ Extensive data from studies over a wide range of flow conditions give many of the answers to these complex flow problems. Here is a big step forward from expensive and time-consuming trial-and-error solutions.

By D. P. Sobocinski and R. L. Huntington....Page 43

Spread Radios Speed Modern Pipe Laying

☐ Better control, more efficient and safer construction result from instant communications between all parts of the spread, the superintendent of the field office. Maintaining radio equipment in top condition is essential ... here is a handy guide.....Page 48

Wanted: More and Better Engineers

☐ Whether the U. S. is losing the technological race with Russia is a matter of much debate. If we are losing, it is because of our failure to attract enough students into engineering—and to offer them a superior education after they enter the field. Here is a sound appraisal of the problem.

John M. Campbell.....Page 52

How to Get Top Results From Interviews

☐ Interviews are the most used—and misused—personnel tools in the oil industry. Here is a candid discussion of the most common faults in modern interviewing methods, plus an excellent outline designed to help you improve interviewing skills.

By Harold A. Edgerton.....Page 56

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Don't Delay Import Solution

Disrupted Middle East shipments provide only a temporary solution to the U. S. oil import problem. Present relief does not offer even a partial permanent solution to this highly serious question.

True, the U. S. oil industry is going to benefit greatly for the time being from increased production to meet the emergency shortage in international markets. Enlarged U. S. production will provide needed relief to producers from stringent proration. Furthermore, currently excessive crude stocks will be reduced.

This is fine for the U. S. producer. However, these benefits will be only temporary. In time, Middle East oil will return to international markets.

•

Serious economic conditions will confront the U. S. oil industry when the Middle East emergency is over.

U. S. production and exports will have to be reduced to normal levels. This will not be easy. Drastic cutbacks never are easy, especially when hundreds, even thousands, of different individual and company interests are involved.

The import problem, at the same time, again will face the U. S. Returning Middle East oil shipments and other imports will again bring this question to the forefront. It may well be more serious than experienced previously.

Many factors will increase the pressure to import oil into the U. S. Tanker capacity in operation is being increased. Middle East companies and countries will want to make up some of their lost revenues.

Such conditions will not be conducive to settlement of the import question.

•

Now is the time for the U. S. to do something about the import problem. Instead of postponing a decision on import curbs now is the time to work out a solution.

Normal shipping and marketing patterns have already been disrupted by stoppage of Middle East shipments. It would be much easier on Middle East countries and companies, and on U. S. producers too, if they know in advance what conditions will exist at the end of the current emergency. If the U. S. made known its intentions now, everybody concerned would have some time to take steps that might soften their hardships.

If a definite course of action is postponed until after the Middle East emergency, as Office of Defense Mobilization Director Arthur Flemming has stated it will be, the question will be more difficult to solve than now.

•

This is largely the responsibility of Director Flemming. He is the one who must take the initiative in working out a solution. He should not let this opportunity pass without seeing that a definite pattern for future U. S. imports is established.

As stated in a previous editorial (Page 4, PIPE LINE INDUSTRY, December, 1956):

"But the subject (imports) is so important that the best brains of the industry—not firebrands on either side—should be called together by our government to work toward a solution of this problem."

There must be a fair apportionment of imports to domestic production if the best interests of the nation and the oil industry are to be served by a healthy U. S. oil industry, which recent world events have demonstrated are absolutely essential to America's national security.

Now is the time to do this. Current conditions are more opportune than in the past or than will exist once the Middle East emergency is over.

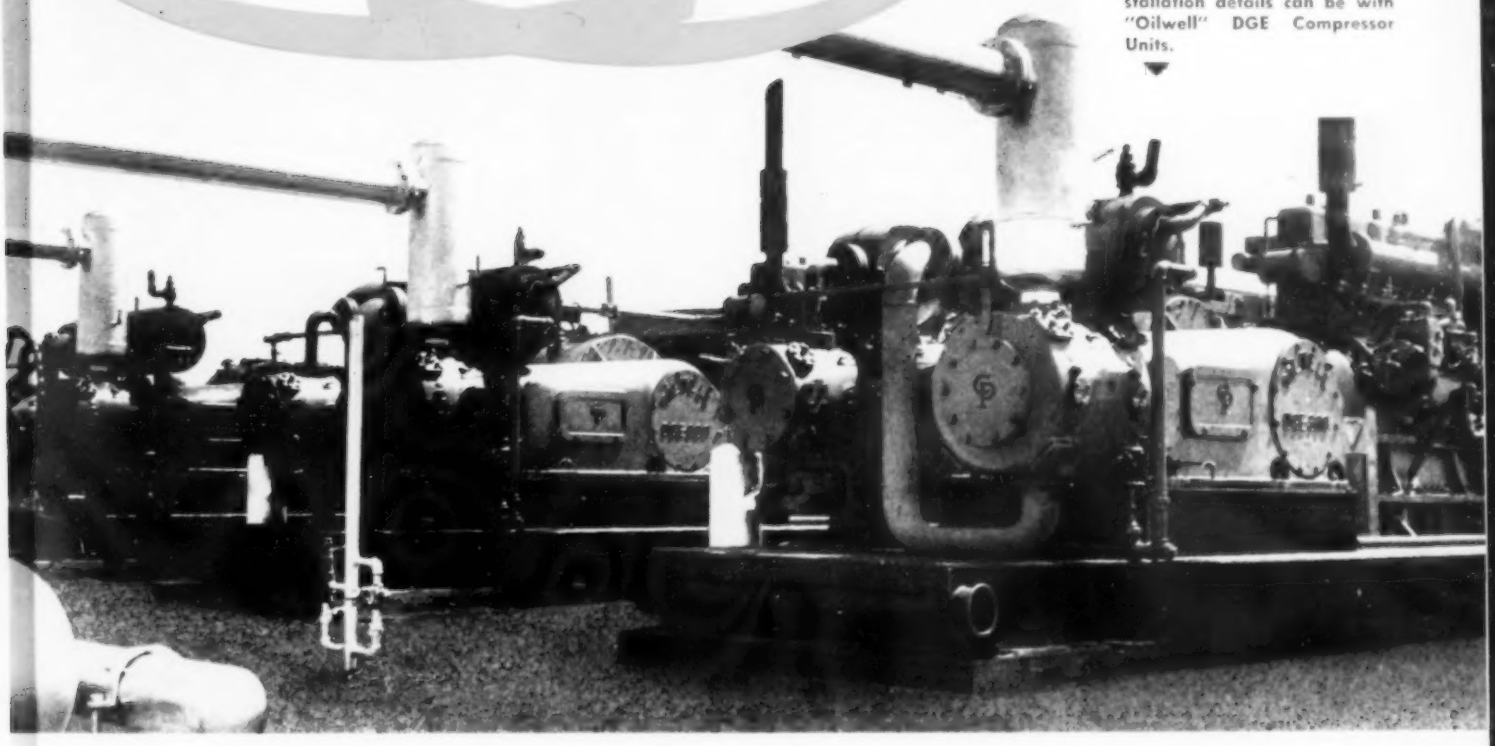
Ray L. Dudley

Another Gas-Gathering System relies upon

"Oilwell" Direct-Connected Compressor Units

In this application, cooling fans are positioned outside the building. Updraft action eliminated consideration of prevailing wind problems.

This photo was made before the building was erected . . . showing how simple the installation details can be with "Oilwell" DGE Compressor Units.



Near Graham, Texas, Universoil, Inc. is gathering gas at field pressures of approximately 20 psi and discharging it into transmission lines at 800 psi with "Oilwell" DGE-300 two-stage compressor units. In this installation, each of the three units has a capacity of approximately 1,275,000 cu. ft. per day at compressor speeds of 300 rpm.

These duplex units consist of two slow-speed, horizontal-type compressors with top suction and bottom discharge connections. They are mounted side by side and are driven through right-angle, spiral-bevel gears by a single prime mover—all on a common skid base.

Each unit has its own heavy-duty, horizontal, updraft radiator with divided core for separately cooling the engine and compressor. For 250 and 300 hp sizes, the radiator and fan assembly is mounted adjacent to the engine and driven from the crankshaft by means of a torque tube and fluid coupling.

An "Oilwell" Engineer will be glad to help you select the compressor that is best suited for your next application. Our various units, ranging in size from 20 up to 300 hp, provide a wide choice.

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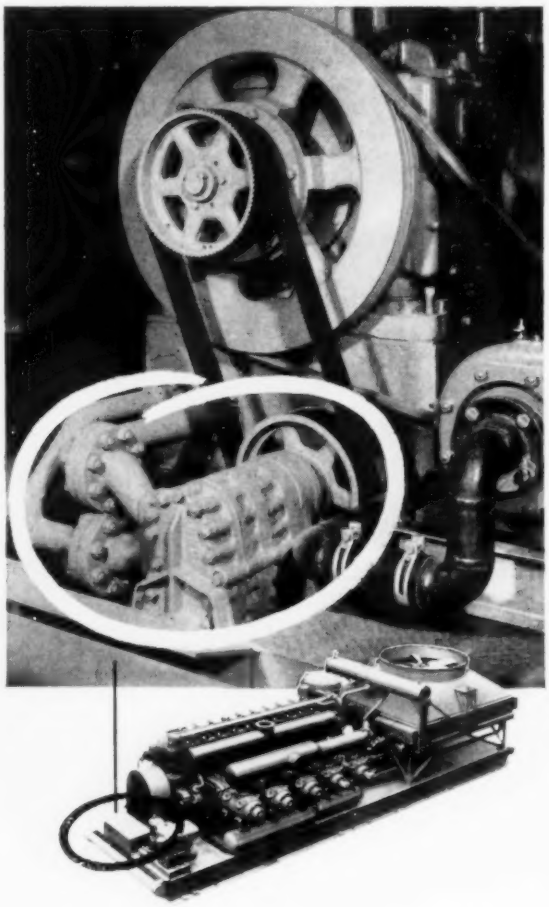
BERRY® Hydraulic Drives . . .
Standard on Clark Compressors

TAKE A TIP FROM CLARK



Berry drives give:

- COOL WEATHER ECONOMY
- PRECISION TEMPERATURE CONTROL
- INFINITELY VARIABLE FAN SPEED
- FLEXIBLE FAN LOCATION
- LOWER MAINTENANCE COST
- SIMPLIFIED POWER TRANSMISSION

These are the reasons Clark Bros., Inc. standardized on Berry Hydraulic Drives to run the direct mounted radiator fans on their portable, skidmounted HMA-B Compressors. They replace conventional belt drive and jack shaft. Clark finds that versatile Berry Drives give them greater latitude in locating the radiator fan. Their customers like the infinitely variable fan speed that can be changed to fit the cooling requirement. Since input horsepower is only that necessary to operate the fan under any given temperature condition, there is a saving in power during cooler weather. Proved too, are lower upkeep costs and longer component life resulting from the cushioning effect of fluid power.

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PIPE LINE INDUSTRY

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PIPE LINE INDUSTRY and the **PIPE LINE COMPOSITE CATALOG** (first edition to be issued in July, 1957) for the oil and gas pipe line industry.

WORLD OIL and **THE COMPOSITE CATALOG** for the drilling-producing-pipe line industry.

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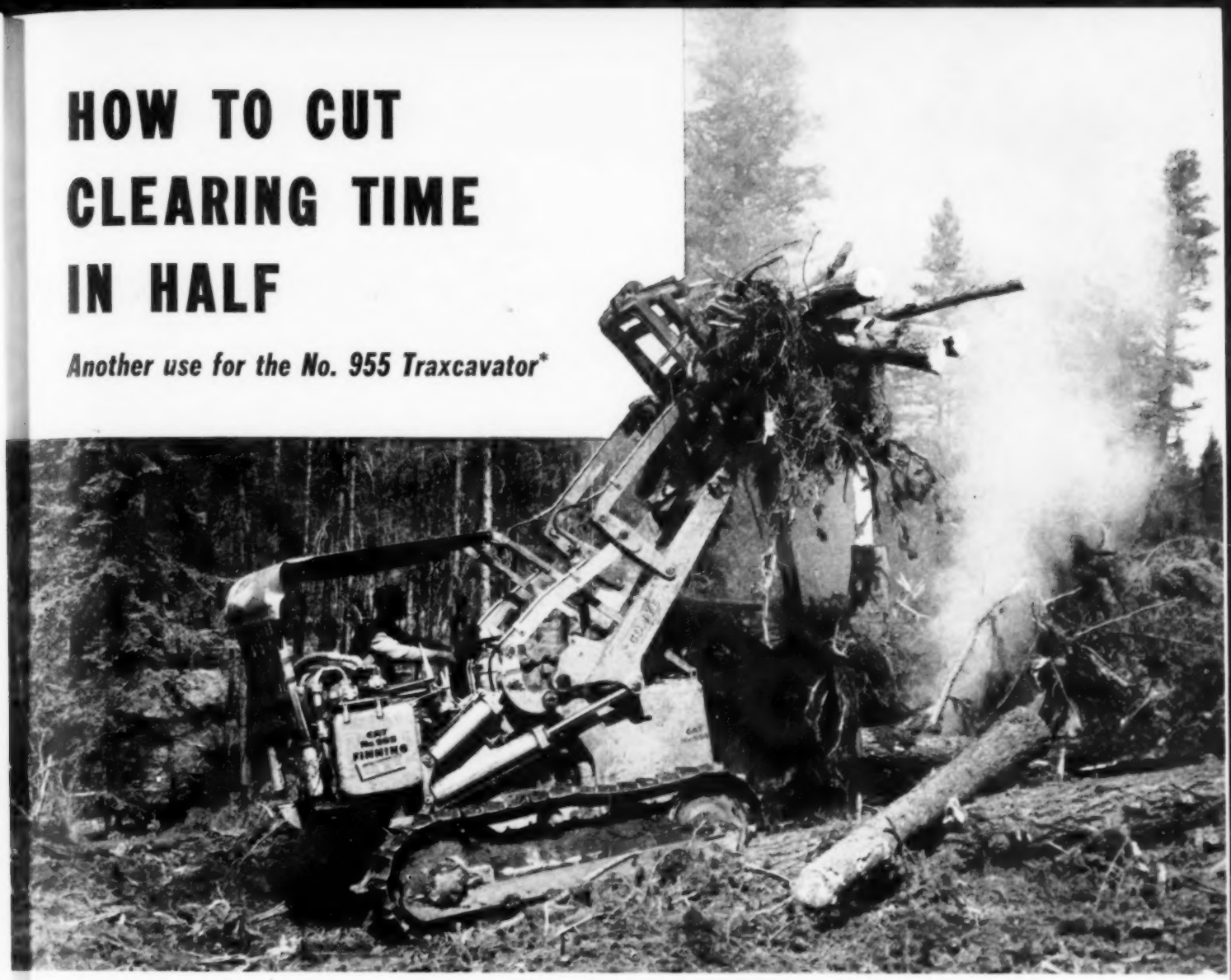
HOW TO CUT CLEARING TIME IN HALF

Another use for the No. 955 Traxcavator*



Conyes Construction Corp., San Pablo, Calif., is using six Caterpillar No. 955 Traxcavators to clear 210 miles of pipeline right-of-way in British Columbia. The company estimates that these Cat-built units *are cutting clearing time in half.* Here's how:

To cut a 60-foot-wide path through jack pine and fir, a D8 knocks down the trees. Everything over eight inches is salvaged by a crew. Then the No. 955s, equipped with alligator jaws operated with a hydraulic ram, pile the logs along the right-of-way and the remaining material on brush fires. The Traxcavators are even used to accelerate the fires. The units lift the top of the pile and use their blower-type engine fans to get a hot fire going quickly.

This method of clearing has enabled Conyes to average one-half to three-quarters of a mile per day in rough going—even working in 10 to 20 inches of snow!

The No. 955 is the newest Caterpillar-built equipment for pipeline spreads. Worked with alligator jaws, general purpose bucket, skeleton rock bucket, or bull-dozer blades, this versatile unit enables you to pioneer roads, clear, backfill, build equipment sites and storage yards, and load trucks.

There are three sizes of Caterpillar-built Traxcavators—the No. 933, the No. 955 and the No. 977. They range in size from one-yard to 2¼-yard capacity, and, like all CAT* pipeline equipment, are designed to stay on the job.

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Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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	.142"	6.61
	.156"	7.25
	.188"	8.64
	.219"	10.00
	.237"	10.79
6⅝	.134"	9.29
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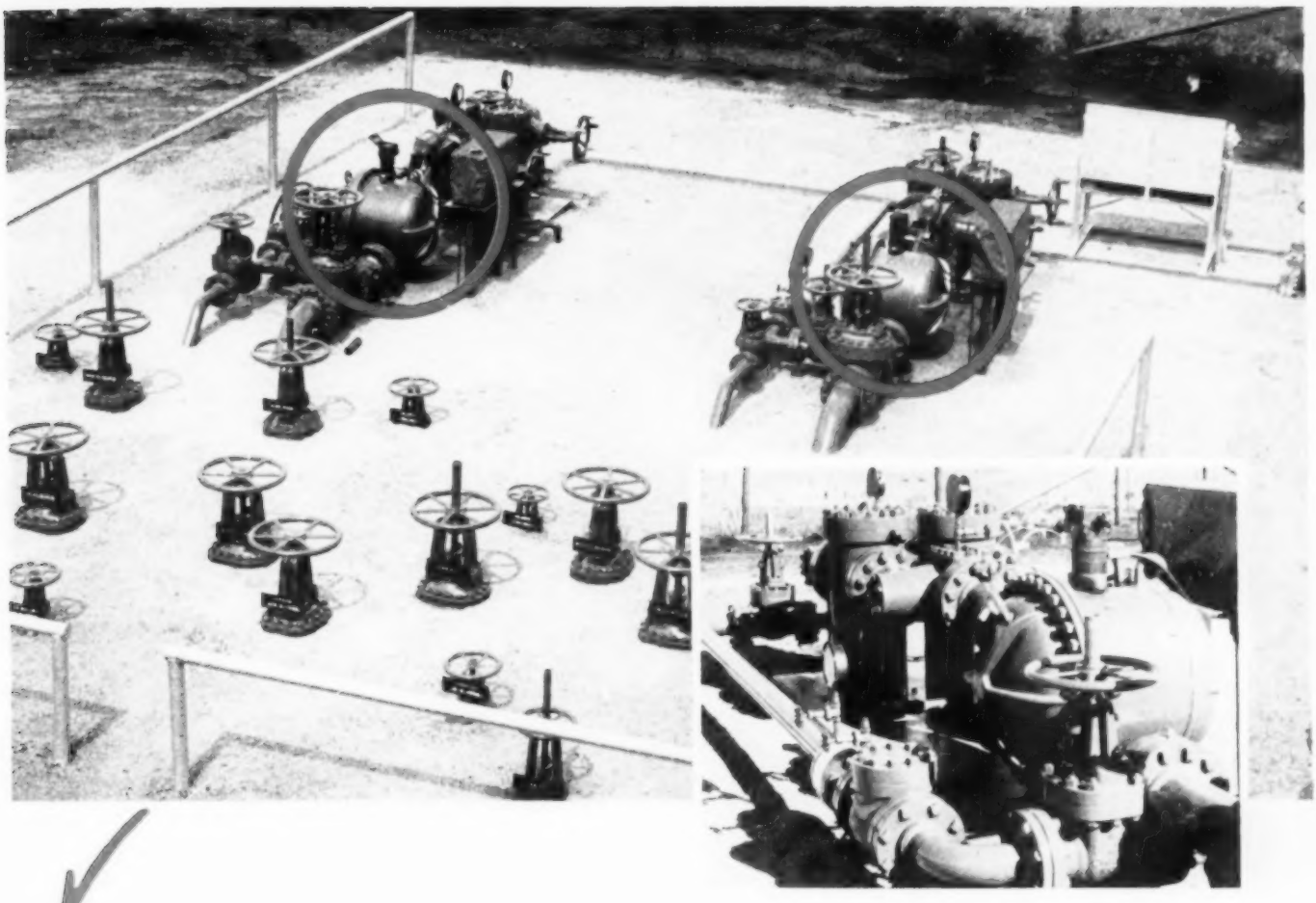

Pipeline deliveries of crude to the refinery are measured by Brodie BiRotor Meters

This meter application simplifies control, provides accurate delivery records, offers savings on operating costs, and reduces tankage as deliveries can be metered direct to a working tank.

Tidewater Oil Company's recent installation at the Nichols, California Station, meters crudes in lines feeding their Avon Refinery. The photographs above show two Brodie BiRotor Meters, each capable of handling 1800 bbls/hr.

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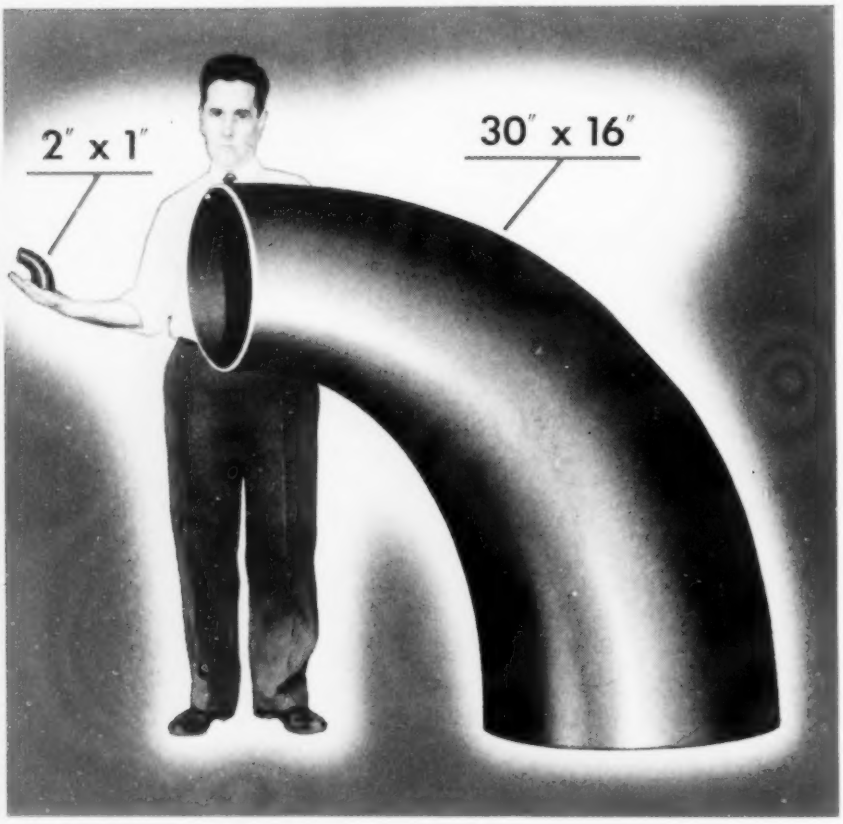

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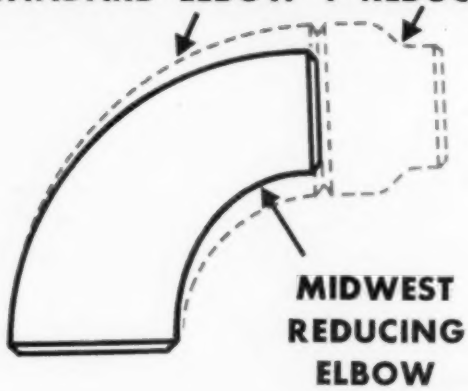

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Youngstown maintains sales and service offices throughout the oil and gas producing country—see your area representative soon.

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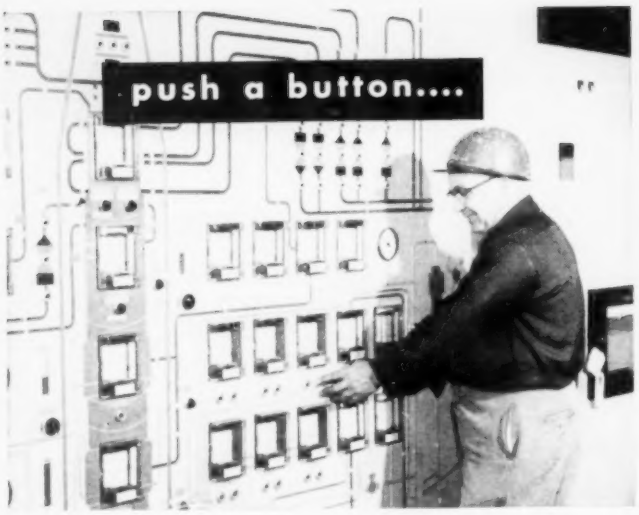

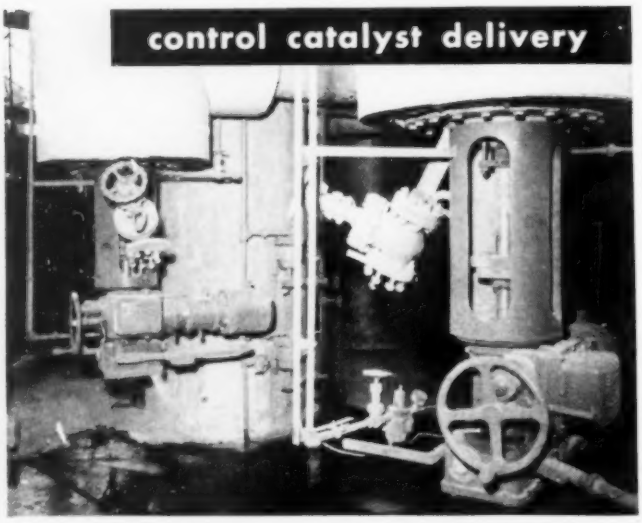

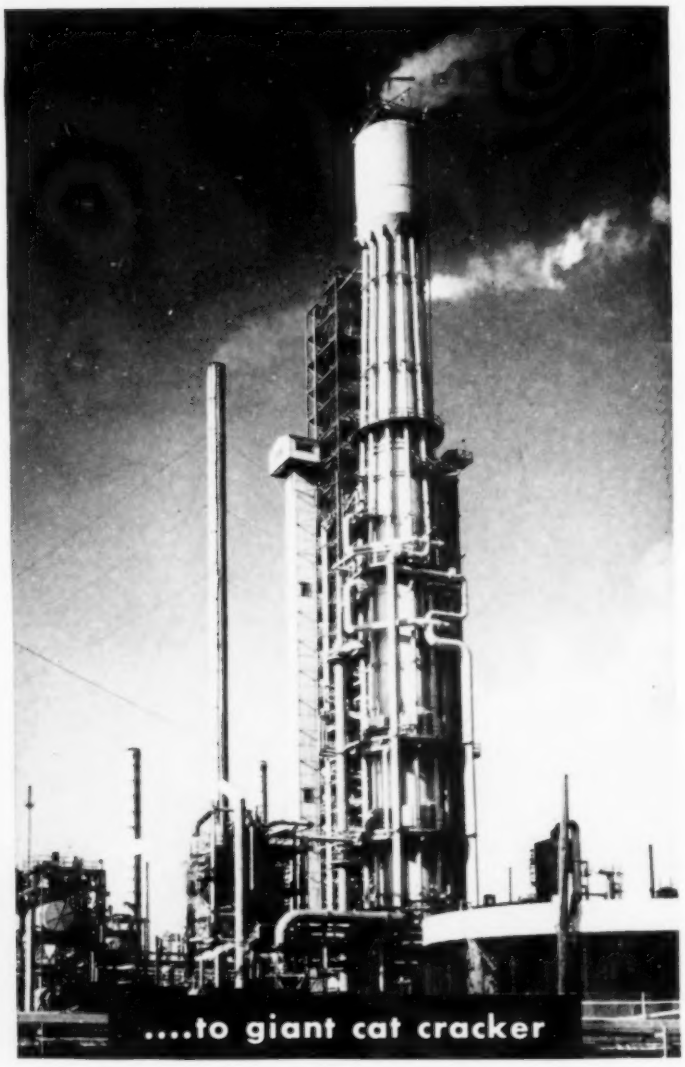

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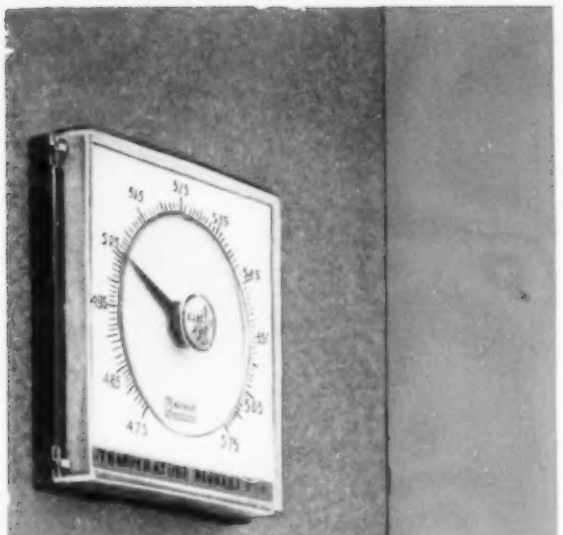
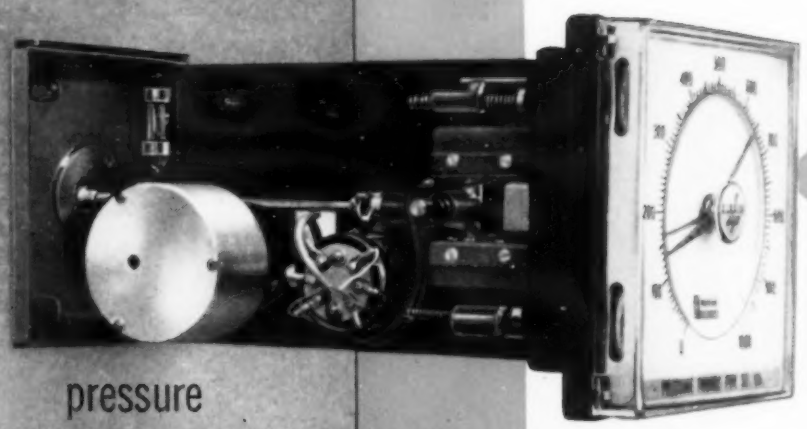


temperature



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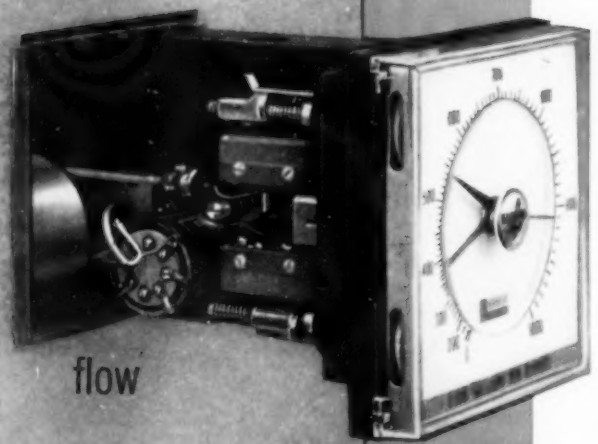

flow

Photo shows convenient panel pull-out drawers

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HIGHer reliability

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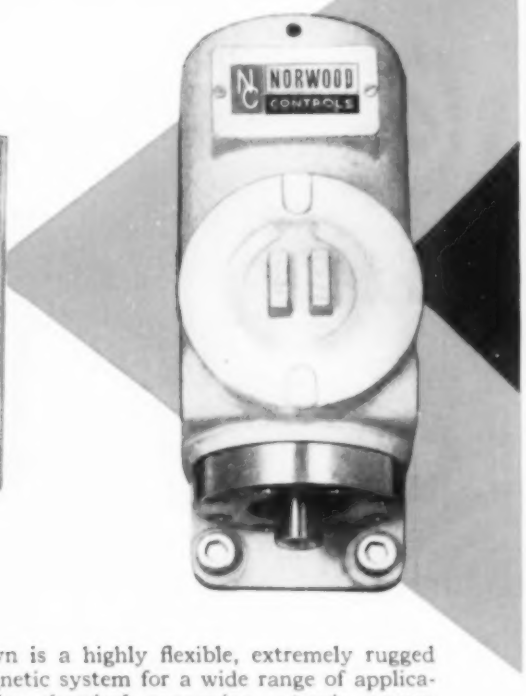
SYSTEM



ElectroSyn is a highly flexible, extremely rugged electro-magnetic system for a wide range of applications in the chemical processing, atomic power, natural gas and petroleum transmission fields. It is designed to measure, indicate, record (including analog to digital conversions), or control pressure, differential pressure, flow, liquid level, temperature. Basic system comprised of signal transmitter, servo amplifier (magnetic), and Null Balance Indicator — no electron tubes or slide wires.

Leading pipeline companies are currently using ElectroSyn Systems for remote indication and data handling of pressures and flows. They point out that ElectroSyn is especially practical for pipeline compressor station applications because the system can withstand a static overload of 300% of rated pressure for a 1% zero shift, with a bursting safety factor of ten times rated pressure for ranges up to 1500 psi.

Complete technical information upon request.

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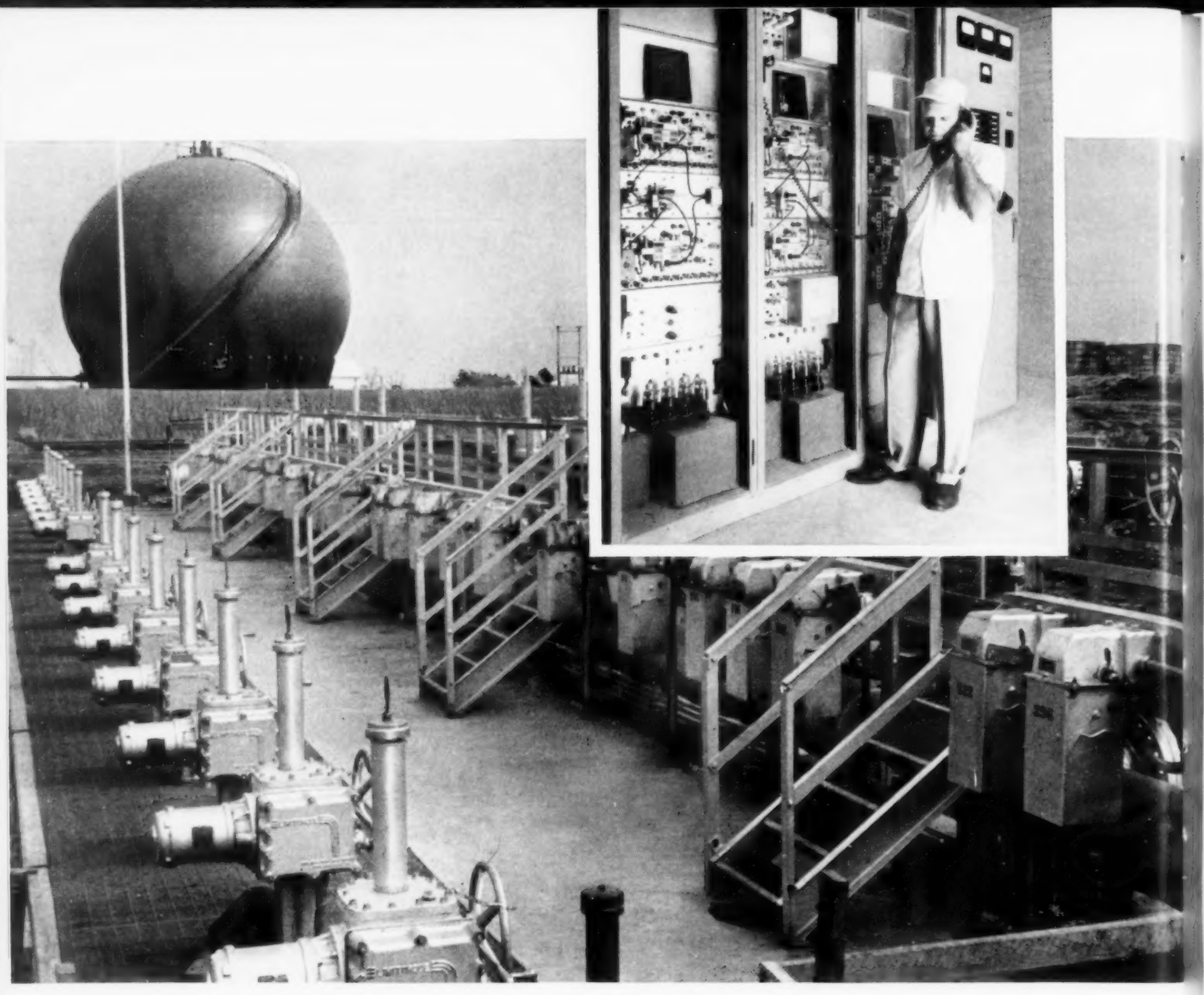

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Operating your private Westinghouse communications system affords complete system control—facilities can be changed or expanded as needed. Westinghouse microwave has exclusive, advanced design features which provide:

Proved Dependability—in one complete, packaged system you can get reliable communications, plus the most advanced telemetering and remote control—an ideal partnership for efficient pipeline operation. Every component is tested for reliability, proved by thousands of hours of actual operation.

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Westinghouse will assume full responsibility for your microwave system . . . from survey to final approval in service. J-60901

Call your Westinghouse sales engineer to arrange a microwave system study for your pipeline, at no expense to you. Ask him for your free copy of B-5851, or write: Westinghouse Electric Corporation, Powerline Carrier and Microwave Dept., Halethorpe, Md.

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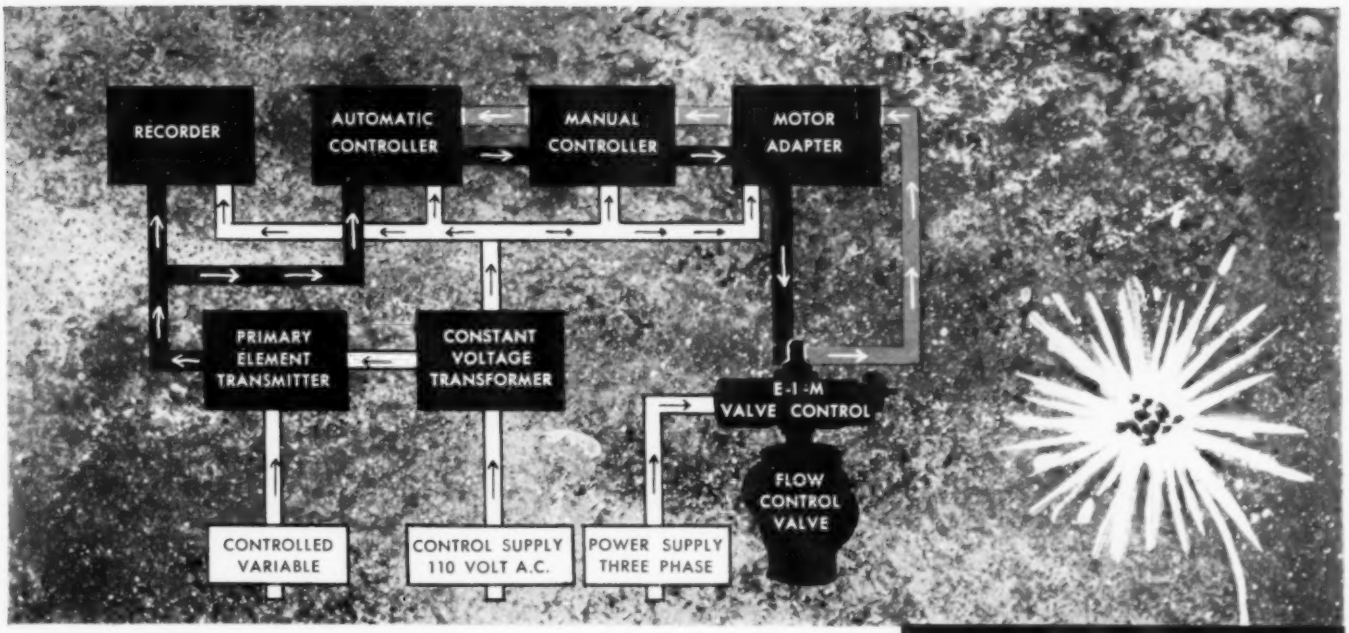

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VALVE CONTROL

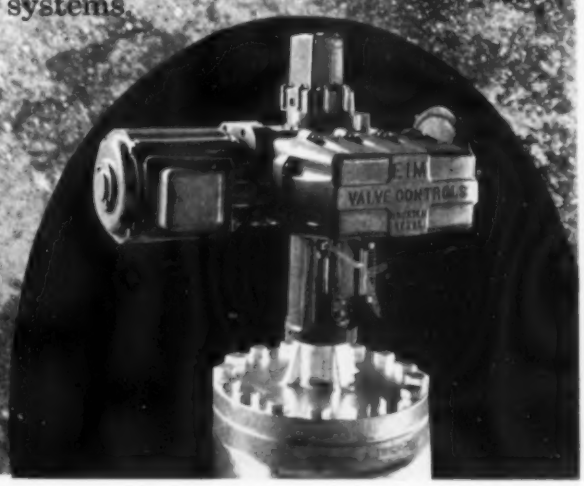
E-I-M FUTRONIC valve control, the first all electric power operator for actuating control valves in throttling and regulating services.

The fully flexible electronic control system, utilizing A.C., D.C., motion inputs as well as conventional primary elements, is highly suitable for process and power instrumentation.

The FUTRONIC valve control system, is particularly valuable in meeting pipe line compressor station, pipe line pumping station and metering station requirements.

Units are adaptable for readout, cascading, computer and similar systems. Transmission distances of great length are permissible and it is possible to tie in with leased wire, micro-wave and other metering systems.

For complete details of the FUTRONIC valve control write



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American Louisiana Pipe Line protects approximately 600 miles of its pipe coating with

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Permits high-speed wrapping... assures effective protection for coating.

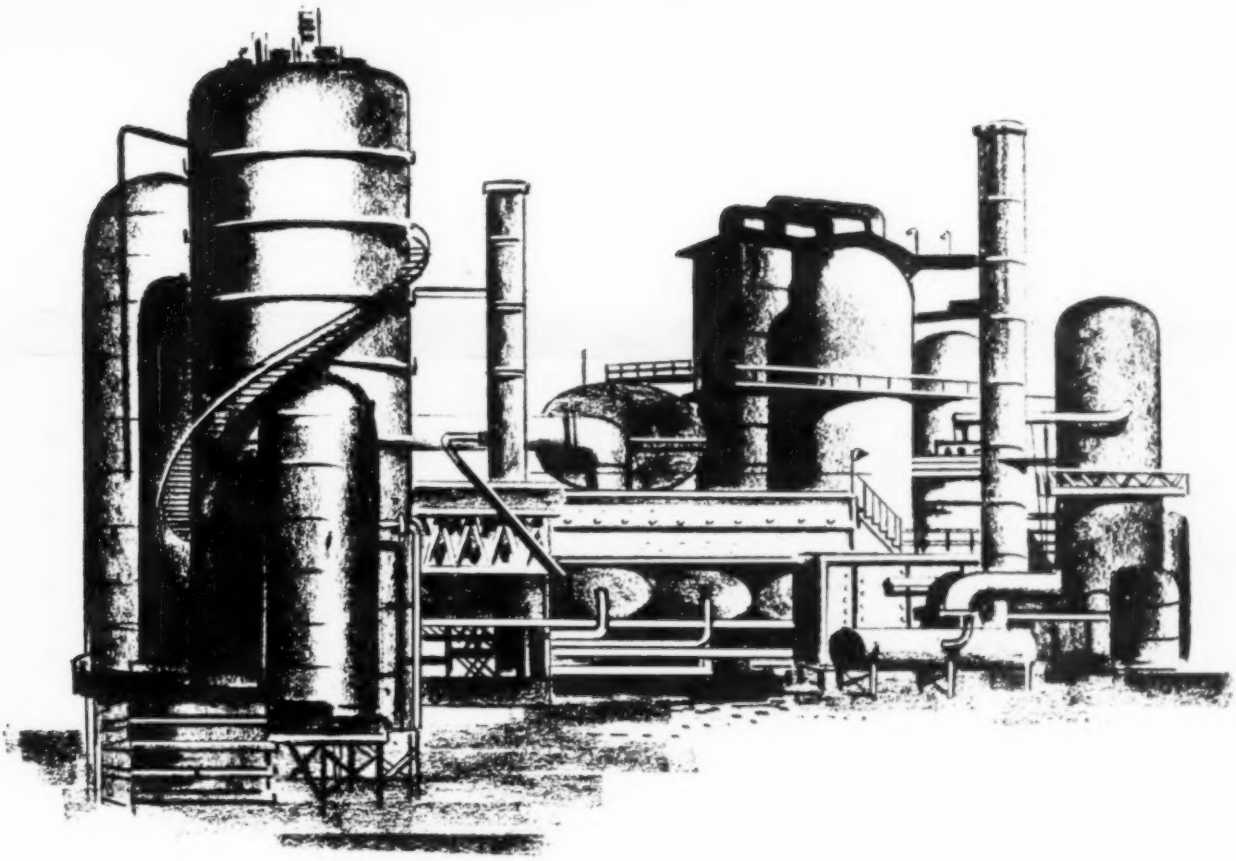
Transhield gives high value for a reasonable cost . . . made of tough, long-life asbestos reinforced with parallel glass yarns . . . it forms a continuous sheath between the enamel coating and the soil to guard against soil stress and give long life to the pipe line coating.

Contractors like Transhield's light weight and easy application . . . it speeds up coating operations . . . the high tear strength (a knife is used to cut it) and 800-ft. rolls lower construction costs.

For further information write to Johns-Manville, Box 14, New York 16, N.Y.; in Canada, 565 Lakeshore Road East, Port Credit, Ontario.

American Louisiana Company's pipe line runs from Cameron, Louisiana to Detroit, Michigan, with a 22" tie line from Defiance, Ohio to Bridgman, Michigan. In the stretch from Southern Louisiana and Willow Run, it crosses eight states and nine major rivers and lakes

Johns-Manville PRODUCTS FOR PIPE LINE PROTECTION

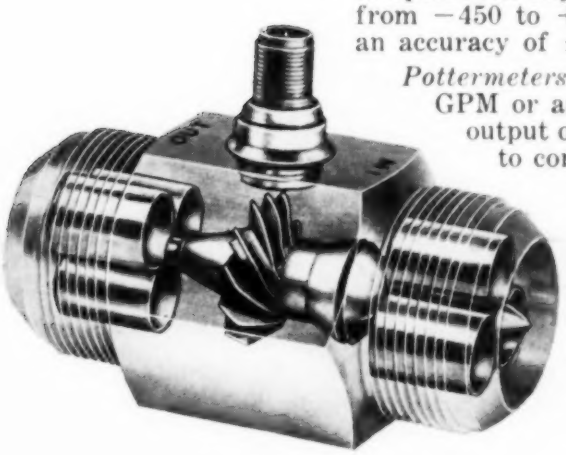


FOR VITAL FLOW CONTROL

WHETHER you're developing a new process or modernizing an old one—investigate the unique characteristics of the bearingless *Pottermeter*.

This electronic flowmeter—easily installed in any type of piping to operate at any angle, at any pressure and at temperatures from −450 to +1200°F, measures flow of any liquid with an accuracy of ±½ of 1%.

Pottermeters are available to measure flows as low as 0.07 GPM or as high as 3,000 GPM. The inherently linear output of the *Pottermeter* makes it ideal for systems to control either flow rate or total flow.



Find out how the bearingless "floating rotor" used in the *Pottermeter* can give you more precise flow measurement, longer trouble-free service life, and more accurate flow control.

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Makers of "Potter Engineered" products

For more data on advertised products, use Readers' Service Cards, last page.

CLEVELANDS trenching and backfilling on the TRANS-CANADA PIPELINE

● This Cleveland is one of several 320's excavating trench for 34-inch pipe on the 574-mile Alberta-Winnipeg leg of the 2,250 mile Trans-Canada pipeline. Trench for the big line goes as deep as 76 inches, 52 inches wide at bottom. Average production for each Cleveland is better than a mile a day.

Photos courtesy Trans-Canada Pipe Lines, Ltd.

Cleveland 190 backfiller is fast worker, stays right on heels of lowering-in gang in boggy area of western Saskatchewan. One-man-operated, the 190 has all speeds in either direction, maneuvers fast and saves dozer time on crossings. Perfectly balanced on long, sealed-bearing crawlers, it easily negotiates wettest swamps and toughest hills.

Width across trench top varies according to soil conditions. This Cleveland 320, equipped with slopers, is cutting as much as 8 feet wide at the top to 4 feet wide at the bottom. In Saskatchewan's "Little Sahara" region, sloping to these widths was normal.

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PIPE LINE PANORAMA

U. S. Pipe Lines Aid Western Europe . . . Emergency plan to move Western Hemisphere crude to Europe is rolling in high gear—and U. S. pipeliners are playing a major role. (See Page 20).

Industry and government officials predict peak need in first half of '57 for at least 850,000 bpd over normal crude shipments—350,000 bpd to replace Mid-East imports to East Coast—500,000 bpd for Europe.

Officials estimate need could be met in this manner:

- Pipe lines to move 600,000 bpd additional crude (over July totals) to Gulf ports by diverting streams, exchanges and reversal of lines.
- Tank cars could handle 150,000 bpd, plus another 110,000 bpd by barges, railroads and trucks.
- Pipelining crude to Wood River, Ill.; Chicago; Lima, Ohio; then by tank car to East Coast—another 240,000 bpd.

Interior Department says first method is only feasible action to take at present time.

Emergency Concession for Pipe Lines . . . In times of national emergency (CONELRAD Radio Alert), U. S. pipe lines may continue radio service for telemetering or control purposes, as well as for protection of pipe lines and transmission systems.

Micro-wave systems may also continue to operate.

This major concession, long sought by API, AGA and PIEA, is announced in CONELRAD Manual for Industrial Services.

New Trend in Pipe Line Automation . . . Look for rapidly expanded use of lease automatic custody transfer installations. Box score to date (in operation or under construction): 19. Users include Stanolind, Texaco Exploration, Texas Company, Gulf Oil Corporation, Western Gulf, Imperial Oil Company, Shell, Phillips, Sinclair and British American.

Advantages over hand methods: More accurate measurements—conserves oil—safer—saves on steel—reduces pumping power and line sizes for new systems—better utilization of manpower—permits use of streamlined accounting methods.

Pipe Lines to Replace Suez? . . . Pipelining from Middle East to eastern Mediterranean ports is most economic way to supply Western Europe with crude—so states United Nation's *Monthly Bulletin of Statistics.* Reasons:

- Ton of tanker capacity from Mediterranean to Europe can deliver nearly 16 tons of oil annually.
- Caribbean-Western Europe route, second most efficient, can supply 10 tons of oil per tanker ton annually.
- Tankers taking Suez route can deliver only 7 tons per year per tanker ton.

This economic fact adds even more fuel to fiery arguments in favor of bypassing Suez by pipe line.

Suez Crisis Puts Pressure On U. S. Pipe Lines

More crude is being moved to the Gulf Coast week by week—but how much more remains a big question.

THE OIL LIFT to Western Europe is moving into high gear this month, with U. S. pipe line companies straining to meet the paper goals and plans outlined by the Middle East Emergency Committee (MEEC).

Although the plans have turned to action at a phenomenal rate, certain shortcomings have become apparent, thus marring the smooth flow of oil to meet Europe's needs. One glaring example is the apparent inability of U. S. pipe lines to move substantially enlarged quantities of crude from interior producing areas to seaport terminals. It is now obvious that pipe line capacities are inadequate in case of a national emergency.

Between November 1 and December 8, a total of 14 million barrels (528,000 barrels per day) of crude was shipped to Western Europe from Gulf Coast U. S. ports. Of this amount 9 million barrels came from storage, mostly from the Gulf Coast. With higher shipments to Europe due in January, much revamping of pipe lines has been made necessary.

A complete report on oil industry actions to date, including the problems involved in the movement of crude to the Gulf Coast and on to Europe, is presented in detail in the following exclusive PIPE LINE INDUSTRY report:

Tankers Turned Away From Gulf Ports. Even though pipe line companies are taking every action possible to move additional crude to the Gulf, tankers are being turned away because of lack of oil.

The British Petroleum Company advised the Texas Railroad Commission it wanted to purchase 3 million barrels of crude at Gulf Coast ports in January, and had the tankers available, but was being forced to re-route the tankers to the Middle East around the Cape of Good Hope because the company was unable to buy enough crude at Gulf ports.

Progress to Date. Despite the current shortage of crude at port terminals, the oil industry has accomplished much in a remarkably short period of time. During July, before the Middle East crisis, tankers lifted 425,000 barrels of crude daily from the Gulf Coast, only 2000 barrels of this amount going to Western Europe. In late November and early December the rate was 1 million barrels daily—the increase going both to the East Coast and to Europe. Product liftings, too, were on the rise.

In short, the U. S. oil industry has been coming up with more crude week by week (see Table) since Operation "Oil Lift" began, but how much more remains a big question.

Basis for Planning. How much "extra" crude the U. S. can provide Western Europe is based on a figure being used extensively within industry and government circles, and by the MEEC, but withheld officially. That figure—the starting point for all emergency planning—is the total average of crude delivered to the Gulf Coast by oil pipe lines during July, 1956—2,635,000 barrels daily.

To show how this figure is being used—indications were that during December 2,910,000 barrels of crude daily were shipped to the Gulf Coast—a gain of 275,000 barrels per day over July.

Potential Pipe Line Capacity. The total potential capacity of pipe lines to the Gulf Coast has increased 62,000 barrels per day in the past six months. The Department of the Interior has estimated that pipe line capacity might be increased to 3,295,000 barrels per day—385,000 barrels per day more than was shipped to the Gulf last month—if all-out measures are taken.

In answer to a PIPE LINE INDUSTRY query regarding how much "extra" crude could be moved to the U. S. Gulf Coast from Texas and Louisiana oil fields, Hugh Stewart, director of the Office of Oil and Gas, Department of the Interior, replied: "We can move in the neighborhood of 600,000 barrels a day (over July shipments) through existing pipe line facilities. That might be upped another 50,000 barrels daily, but to go above the 600,000 barrels we would undoubtedly have transportation problems."

Even so, the big boost in pipe line movement will still be a far cry from the 850,000 bpd goal (350,000 barrels to meet East Coast needs—500,000 bpd for Western Europe) that was widely publicized early in December. However, a top official of the Interior Department has spelled out where the rest of the extra crude could possibly come from (on paper at least):

- Pipe lines to increase crude movements to the Gulf 600,000 barrels per day over July totals.
- 150,000 barrels per day could be handled by tank cars.
- 240,000 barrels per day could be shipped by pipe line to Wood River, Chicago, Lima, Ohio, then by tank car to the East Coast.
- 110,000 barrels per day could be moved by barges, railroads and trucks to the Gulf Coast.
- 100,000 barrels per day to be shipped from Venezuela.

The Interior Department emphasized that only the first and last shipping methods are feasible at the present time.

Stewart also told PIPE LINE INDUSTRY that the success—or failure—of the 600,000 bpd goal for pipe lines depends entirely on special actions by pipe line companies to divert streams,

and to make exchanges and reverse the flow of some lines. Top industry spokesmen say that shipments to inland states may be cut down at any time, at reasonable cost, by reversing or diverting the flow on various lines now in service.

Humble Appraises Pipe Line Situation. The most critical area in the supply situation is West Texas-New Mexico where the major portion of surplus producing capacity is located. A study of the status of West Texas pipe lines by Humble Oil & Refining Company indicates that as of January 1, pipe lines from West Texas-New Mexico will be able to move about 1,064,000 barrels daily to the Gulf Coast. In addition, approximately 483,000 barrels are being moved north out of West Texas, and local refineries are using 160,000 barrels.

In October, approximately 850,000 barrels of West Texas-New Mexico crude were moved to the Gulf Coast.

What Pipe Line Companies Have Done. Reports from a number of reliable industry and government sources reveal that the following emergency actions have been taken by various pipe line companies:

- **Humble Pipe Line Company** has increased crude movements to the Gulf Coast 100,000 barrels a day since mid-November.
- **Rancho Pipe Line** to the Gulf Coast is filled to capacity (230,000 bpd). However, a new station is being added at Katy, Texas, which will boost capacity another 25,000 bpd in January.
- **Gulf Oil Company** increased crude movements to the Gulf 30,000 bpd by reversing its 10-inch line from Oklahoma to Lufkin, Texas. Gulf expects to have another 59,000 bpd increase when the West Texas Gulf Pipe Line Company completes its expansion program early in January.
- **Service Pipe Line Company** has boosted pipe line deliveries to the Gulf 17,000 bpd, by adding two booster stations.
- **Standard Oil Company of California** is rushing its studies of a new 600-mile crude line from the Four Corners area to Los Angeles. Other companies would join in if the line is built. However, with present steel shortages the line probably wouldn't be completed before 1958.
- **Carter Oil Company** and others are sending Wyoming's Elk Basin crude on a long voyage via pipe line and barge to the Gulf Coast, then by tanker to Europe.
- **Texas Eastern Transmission Company** is hurrying its action before the FPC for permission to convert parts of its Little Inch to oil products.
- **Underground Exploration Company,** Upper Darby, Pennsylvania, has proposed a tie-in at the Pittsburgh end of the converted Texas Eastern line on to Newark, N. J.
- **Texas Railroad Commission** reports deliveries of crude to the Texas Gulf Coast could be increased 100,000 barrels daily over the October level by reversing some products lines now delivering from coastal refineries to inland cities. However, the Commission says the federal government should initiate any studies along these lines.
- **Texas-New Mexico Pipe Line Company** officials have approved project to construct a 16-inch line from company's Jal, N. M., station to the Four Corners area where Utah, Arizona, New Mexico and Colorado meet. Length: 515 miles. Capacity: 50,000 bpd.
- **Sun Pipe Line Company** is diverting a portion of its deliveries to East Texas, in the amount of 30,000 bpd, to the Gulf Coast.
- **Between 20,000 and 25,000 barrels of oil** are being shipped northeast from West Texas to St. Louis, then taken by barge down the Mississippi River to the Gulf Coast. Much additional oil could be shipped by this expensive routing if enough barges were available.

—The End

Movements of Crude and Products from U. S. Gulf Coast

Tanker liftings of crude oil from the U. S. Gulf Coast were about 425,000 barrels daily during July of this year. Nearly six months later, in the first week in December, they made a fantastic climb to 1,002,000 barrels daily.

The story of extra liftings from the Gulf is told in the following table prepared for PIPE LINE INDUSTRY by the Office of Oil and Gas of the Department of the Interior, in cooperation with officials of oil-producing states and the U. S. Bureau of Mines.

(Thousands of Barrels Daily)

Period and Destination	Crude	Gasoline	Kerosine	Distillate	Residual	Other	Total
July:							
W. Europe	2	20	...	8	...	6	36
August:							
W. Eurpoe	7	32	...	20	5	4	68
September:							
W. Europe	2	17	...	32	1	8	60
October:							
W. Europe	12	14	...	22	...	1	49
November 1-7:							
East Coast	311	564	70	392	147	53	1,537
W. Europe	...	25	...	...	...	16	41
	311	589	70	392	147	69	1,578
November 8-14:							
East Coast	642	704	153	550	115	65	2,229
W. Europe	81	32	...	65	25	9	212
	723	736	153	615	140	...	2,441
November 15-21:							
East Coast	584	514	104	534	185	91	2,012
W. Europe	233	15	2	68	-	3	321
	817	529	106	602	185	94	2,333
November 22-28:							
East Coast	473	639	141	487	134	76	1,950
W. Europe	609	59	14	208	53	1	944
	1,082	698	155	695	187	77	2,894
November 29-December 5:							
East Coast	647	590	130	496	138	84	2,085
W. Europe	355	40	22	212	5	2	636
	1,002	630	152	708	143	86	2,721

PIPE LINE INDUSTRY Annual Survey Forecasts . . .

Big Increase in Construction for 1957

Reports of 143 U. S. companies show that 16,850 miles of pipe line construction is proposed for the coming year. This 20 percent hike over last year could lead to a record year in world pipe laying.

By MELVIN A. JUDAH
Editor, PIPE LINE INDUSTRY

PIPE LINE CONSTRUCTION in the U. S. should continue at a near record pace in 1957, and considerably above last year, while construction in other countries may attain the highest level in history. The combined result may be a record year in world pipe line activity.

Laying of 16,850 miles of oil, gas and product lines in the U. S. is forecast by PIPE LINE INDUSTRY for 1957. This figure is based on an annual survey in which major pipe line companies report their construction plans. Construction of 16,850 miles of new lines in the U. S. would be 2750 more miles of line and a 20 percent increase over the 14,100 miles constructed during 1956. It would approach the record year of 17,745 miles laid in 1954. U. S. station construction also will be at high level, according to the survey.

Gas transmission line growth again will account for a large share of U. S. construction, although considerably more crude oil lines will be constructed in 1957.

Large scale construction in Canada, Venezuela, and possibly in Western Europe and the Middle East, will highlight activity in other parts of the world.

U. S. Outlook. Gas line construction again is expected to account for much of the U. S. pipe line construction. The construction of 12,390 miles of gas lines is predicted for 1957, of which 9210 miles is expected to be transmission lines and 3180 miles to be gathering lines.

A total of 462,455 gas compressor horsepower is expected to be added in 1957, compared with 512,745 in 1956.

A 20 percent increase in U. S. crude oil line construction appears probable. A total of 3040 miles of new crude oil lines is included in the U. S. forecast, of which 2030 miles is expected to be trunk lines and 1010 gathering lines. This would compare with the laying of 1060 miles of crude trunk lines and 1630 miles of gathering lines during 1956.

The U. S. forecast calls for the construction of 1420 miles of new refined product lines in 1957, in contrast with 1460 miles laid in 1956.

Southern Pacific will extend its "railroad pipe line system" during 1957. Southern Pacific Pipe Lines, Inc., recently let contracts for the construction of a 300-mile product line from the San Francisco Bay area to the Reno-Fallon, Nevada, region.

Crude oil and product pumping horsepower will increase nearly 20

HOW PIPE LINE CONSTRUCTION WILL GROW IN 1957

		MILES BUILT IN 1956	MILES FORECAST FOR 1957
GAS	Transmission	7,700	9,210
	Gathering	2,250	3,180
	TOTAL GAS LINES	9,950	12,390
CRUDE OIL	Trunk	1,060	2,030
	Gathering	1,630	1,010
	TOTAL CRUDE LINES	2,690	3,040
PRODUCTS		1,460	1,420
ALL LINES	(Gas, Crude Oil and products)		
	Trunk	10,220	12,660
	Gathering	3,880	4,190
	YEAR'S TOTAL	14,100	16,850

STATION CONSTRUCTION OUTLOOK

		HORSEPOWER INSTALLED IN 1956	HORSEPOWER FORECAST FOR 1957
COMPRESSOR		512,745	462,455
PUMPING	(Crude and Products)	75,935	93,335
	TOTAL HORSEPOWER	588,680	555,790

percent, with 93,335 horsepower expected to be installed in 1957 in contrast with 75,935 in 1956.

Based on Survey. The foregoing forecast of U. S. pipe line construction in 1957 is based on PIPE LINE INDUSTRY's annual survey of company plans. A total of 143 companies, owning the bulk of U. S. crude oil, gas and product lines, participated in the survey. Virtually every major company in the nation responded. They told PIPE LINE INDUSTRY, in confidence, how many miles of lines they built in 1956 and how much construction they thought they would do during 1957. Individual company reports were combined to obtain an overall total. To this total PIPE LINE INDUSTRY added estimates of other construction by smaller companies and for concerns who did not respond but who had previously announced projects.

For the first time, PIPE LINE INDUSTRY's questionnaire asked for information on the amount of horsepower, both gas and crude-product, expected to be installed.

This survey of construction plans does not include lines smaller than 4-inch in diameter, distribution gas lines laid within corporate city limits, nor lines to be built outside of the U. S. Figures are based upon miles of new lines likely to be laid during the coming year, not miles of lines that will be placed in operation. Portions of lines already completed but not yet in service have been included in the 1956 total. Uncompleted portions of lines have been included in the 1957 forecast.

New San Juan Crude Lines. A major factor in increased U. S. crude oil pipe line construction are plans for new lines from the San Juan Basin, located at the junction of New Mexico, Colorado, Utah and Arizona.

Texas-New Mexico Pipe Line Company recently announced plans for a 16-inch crude line from this area to Jal, N. M. This 515-mile line would move crude from the Four Corners region to Jal, where a connection could be made with pipe lines extending to the Gulf Coast.

Shell Oil Company and Standard Oil Company of California have proposed a 600-mile, 14-inch crude line from Four Corners to Los Angeles. This line would extend southwesterly from the San Juan Basin, passing north of Flagstaff, Ariz., and through the Mojave Desert to Southern California.

Northwest Pipe Line Corporation may construct a 350-mile, 6- to 10-inch crude and products line from San Juan to Salt Lake City, Utah.

Several Major Gas Lines. Prospects for much of the proposed gas line construction depends on quick action by the Federal Power Commission on several large projects. If these are to be constructed in 1957, FPC will have to approve the necessary permits early in the year.

Colorado Interstate Gas Company has a proposal before the FPC to lay 734 miles of 22- to 34-inch gas line from the Texas and Oklahoma Panhandle region to Kit Carson, Colo., and then to Beatrice, Neb. This $87 million project would supply existing systems serving midwestern U. S. cities.

Midwestern Gas Transmission Company's planned 1112-mile line from Emerson on the Canadian border to Nashville, Tenn., also is pending FPC action. This line would deliver Canadian gas from Trans-Canada Pipe Lines, Ltd., to the main transmission system of Tennessee Gas.

Natural Gas Pipe Line Company has a 460-mile, 36-inch looping program before the FPC. Northern Natural is seeking FPC approval on a 167-mile 24-inch gas line to serve Duluth, Minn., and Superior, Wis.

Construction on much of Tennessee Gas Transmission Company's 1085-mile expansion program, presently before FPC, will also hinge on action taken by FPC on other applications to serve the Midwest.

Anticipated early action by the FPC may clear the way for construction of a gas system from Texas to Florida. A joint effort by Coastal Transmission Corporation of Houston proposes to build a 565-mile, 20- to 26-inch line from McAllen, Texas, to connect with Houston Texas Gas and Oil at a point near Baton Rouge, La. Houston Texas Gas would construct a 961-mile, 12- to 30-inch line from Baton Rouge to Florida. This combined $173 million project will be one of the largest construction projects of the year.

Early 1957 will likely see Texas Eastern start importation of Mexican gas through a 422-mile 30-inch line constructed from McAllen to Vidor, Texas.

Much Activity Outside U. S. A number of major pipe line construction projects outside of the U. S. are in the definite stage, and others are being considered.

Trans-Canada Pipe Line Company is pushing construction on its 2250-mile 30- and 34-inch transmission gas line eastward in Canada. It will be the world's longest pipe line when completed. The $378 million project will ultimately bring gas from Alberta Province to eastern Canada cities and may also serve eastern U. S. cities.

Expanded oil production activity in western Canada will necessitate the construction of considerable gathering lines, and some short trunk lines.

A number of Venezuela projects will get underway in 1957. Mene Grande Oil Company will build a 62-mile, 30-inch crude line from Anaco in eastern Venezuela to Puerto La Cruz on the Caribbean Sea. Compania Shell de Venezuela plans a 177-mile, 20-inch gas line from La Paz field to Cardon refinery on Paraguana Peninsula. Creole Petroleum Corporation has plans for a 94-mile, 28-inch crude line from Temblador field to Caripito. Sinclair Oil and Socony Mobil Oil have begun construction on a 211-mile crude oil line from the Barinas producing area to Puerto Cabella.

Bolivian Gulf Oil Company plans a 201-mile, 8- to 10-inch crude line from Sicasica, Bolivia, to Arica, Chile.

Eastern Hemisphere Plans. A major Western Europe pipe line is under study that would reach from the Mediterranean port of Marseilles to northern Europe industrial centers. It would be 500 miles in length, and perhaps 30 inches in diameter, and would deliver crude from Middle East tankers to consuming centers. Its construction depends on the restoration of oil shipments through the Suez Canal.

Preliminary plans have been completed for a 1200-mile, 38- to 40-inch crude line from Kuwait producing fields northward through Iraq producing areas to Iskenderun, Turkey, on the Mediterranean. This line would bypass several of the current troubled areas in the Middle East and eliminate dependence of southern Iraq and Kuwait on the Suez Canal.

There is some talk of constructing a large diameter pipe line through Israel to bypass the Suez Canal.

—The End

OFFICERS

ALLEN

WILLIAMS

OWEN

GUMP

Present officers of the Pipe Line Contractors Association, in addition to President-Director C. C. Bledsoe, are: Earl Allen, Associated Pipe Line Contractors, Inc., first vice president and director; John H. Williams, Williams Bros. Company, second vice president and director; Kenneth A. Gump, executive secretary.

C. C. BLEDSOE, secretary-treasurer of Midwestern Constructors, Inc., will preside over the convention as president-director. He has had experience in every phase of the pipe line industry, dating back to the early 1930's, and is a member of several professional societies including the NACE. In addition to his responsibilities with Midwestern Constructors, he holds the office of vice president with Comstock Midwestern, Ltd., a Canadian company.

Pipe Line Contractors

MORE THAN 750 leaders in pipe line construction will gather at the Boca Raton Hotel and Club, Boca Raton, Fla., January 13-16, to talk over highlights of 1956 pipelining and take a good look at what's ahead for 1957. It will be the Ninth Annual Meeting of the Pipe Line Contractors Association.

During the past year contractors overcame almost every kind of obstacle to set another record year. New ideas were born on TGT's "swamp land" Muskrat Line, the Rocky Mountain right-of-way of Pacific Northwest, and cold weather work on Westcoast Transmission and Trans-Canada.

In addition to these advancements, the industry leaders will discuss revolutionary possibilities of moving solids by pipe line. Coal and gilsonite lines are due for early operation, and other materials may be considered for cross-country shipment soon.

Highlights of this years' interesting program review past accomplishments and focus attention on the future:

- William R. Connole, commissioner, Federal Power Commission, will give the convention an analysis of the effects of FPC and ICC regulations on pipe lines.
- Charles S. Coates, executive vice president, Trans-Canada Pipe Lines Limited, will present high-

SPEAKERS

CHARLES S. COATS, executive vice president and general manager, Trans-Canada Pipe Lines Ltd., Toronto, Ontario, draws on his close association with every phase of Trans-Canada's growth to discuss the progress of construction of their 2250-mile line. He was senior vice president of Tennessee Gas Transmission Company during its early construction program.

WILLIAM J. MURRAY, chairman of the Texas Railroad Commission, will address the convention on developments in oil and gas conservation—drawing on conservation experience dating back to 1939. He is also chairman of the Texas Petroleum Research Committee, seeking methods to increase the ultimate recovery from the Texas oil fields.

WILLIAM R. CONNOLE, commissioner, Federal Power Commission, Washington, D. C. will analyze the ever-present weight of regulations of the F.P.C. and I.C.C. on pipe line construction and operations. He has a wealth of experience with regulatory problems facing common carriers and gas transmission lines today.

CONYES

GRAY

GREGORY

MANUEL

NEILL

PRICE

Other directors now serving are: R. A. Conyes, Conyes Construction Corporation; Jack S. Gray, Grayco Constructors; R. P. Gregory, Houston Contracting Company; G. A. Manuel, Williams-Austin Company; James P. Neill, Western Constructors; H. C. Price, H. C. Price Company; R. D. Sheehan, Sheehan Pipe Line Construction Company, and M. S. Williams, Panama-Williams Company.

Converge on Florida

SHEEHAN

WILLIAMS

lights of work on Canada's longest gas transmission line.

- William J. Murray, chairman, Texas Railroad Commission, evaluates developments in oil and gas conservation, particularly as related to pipelining and the world situation.
- A panel discussion will be devoted to safety programs and future problems. Safety awards will point out the excellent record of pipe line contractors.
- A panel discussion on water and slurry pipe lines will bring out some of the many possible uses for pipe line transportation in the future. Two new solids pipe lines, due to go into service early this year, have opened up an entirely new field for the industry.

Their development in the future will hold high interest for the pipe line industry. Outstanding programs will continue to attract those leaders who best understand the industry's needs and unlimited potentials.

Program

Pipe Line Contractors Association, Boca Raton Hotel and Club, Boca Raton, Florida

SATURDAY, JANUARY 12, 1957

All Day Golf Tournament begins. Courtesy Polyken Sales Division, The Kendall Company, Chicago, Ill.

6:00 p.m. Pre-convention cocktail party for Officers and Directors

SUNDAY, JANUARY 13

7:45 a.m. Early Birds Breakfast, Boca Raton Hotel. Courtesy Insley Manufacturing Co., Indianapolis, Indiana.

All Day Golf Tournament continues.

6:00 p.m. Buffet dinner and dance, Cloister Lounge and Patio Royale—courtesy H & L Tooth Company, Montebello, Calif.

MONDAY, JANUARY 14

9:30 a.m. General business session—Auditorium (open to all).
1. C. C. Bledsoe, President, presiding.
2. Panel discussion of safety matters—Roger Pentzien, Pentzien, Inc.; Carl C. Lavery, Houston Contracting Company; Bennie G. Pierce, H. C. Price Company, and Walter Weir, J. O. Willett.
3. Address by William R. Connole, Federal Power Commission, Washington, D. C.
4. Panel discussion of water and slurry pipe lines—Fred Culpepper, Ford, Bacon & Davis; Colonel F. J. Wilson, Arkansas Basin Authority; David R. Williams, Jr., Williams Brothers Company; W. A. Swinerton, Engineers Limited Pipeline Company, and John Henderson, American Gilsonite Company.
5. Presentation of safety awards.

11:30 a.m. Luncheon for all ladies attending the convention—Marlin Beach Hotel, Fort Lauderdale, courtesy Allis-Chalmers Manufacturing Company, Milwaukee.

12:00 Noon Cocktails in Cloister Loggia and luncheon in Patio Royale for all men—courtesy M. J. Crose Manufacturing Company, Inc., Tulsa.

2:00 p.m. Golf Tournament continues.

6:00 p.m. Cocktails and steak roast, Cabana Club—courtesy Caterpillar Tractor Company, Peoria, Ill.

TUESDAY, JANUARY 15

9:30 a.m. General Business Session—Auditorium.
1. C. C. Bledsoe, president, presiding.
2. Report of Executive Secretary Richard A. Gump.
3. Address by Charles S. Coates, Trans-Canada Pipe Lines Limited, Toronto, Ontario.
4. Address by Wm. J. Murray, Jr., Chairman, Texas Railroad Commission, Austin.

11:00 a.m. Closed business session for regular members only—Auditorium.
1. C. C. Bledsoe, president, presiding.
2. Reports of committees
3. Election of officers and directors.

12:00 Noon Luncheon and style show by Saks Fifth Avenue in Patio Royale—courtesy Crutcher-Rolfs-Cummings, Inc., Houston.

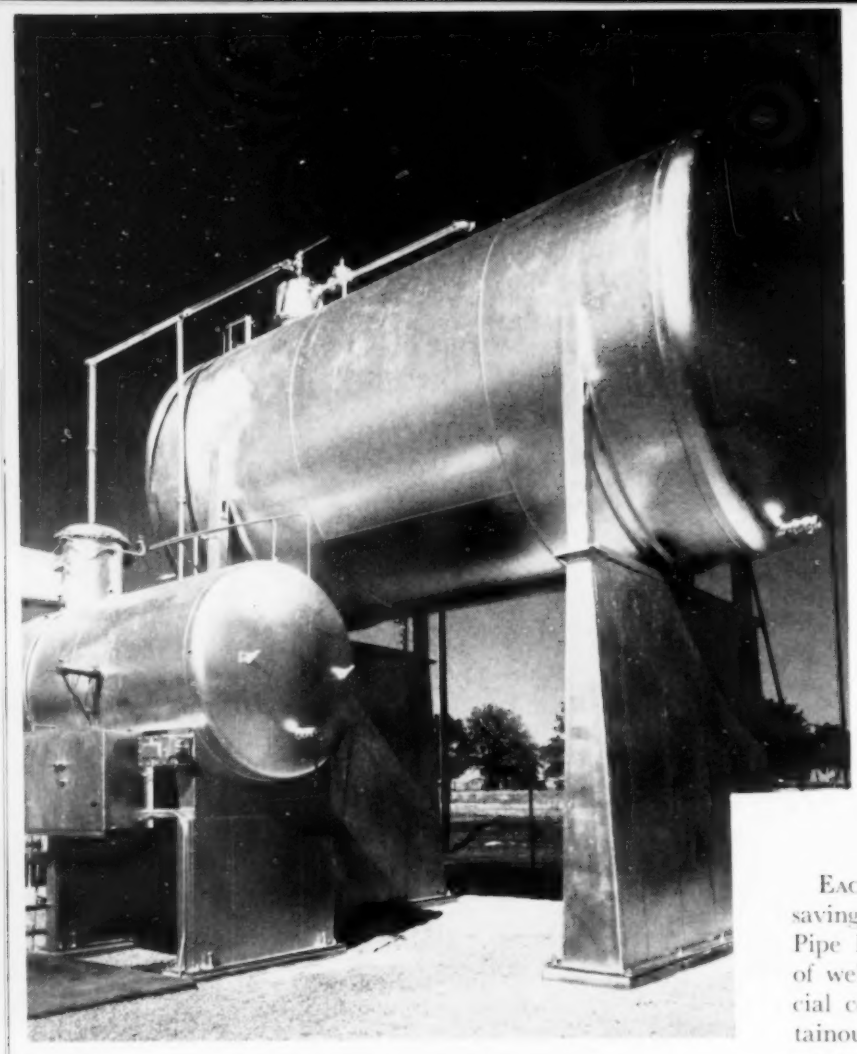
6:00 p.m. Cocktails in Cloister Loggia—courtesy International Harvester Company, Chicago.

7:30 p.m. Annual banquet and floor show, Patio Royale.

WEDNESDAY, JANUARY 16

8:00 a.m. Breakfast meeting of Board of Directors, Polo Room.

10:00 a.m. Meeting of regular members only, for discussion of labor matters—Auditorium.



Stanolind's automatic custody transfer unit is one of the newest developed by the industry. It is a completely mechanical system, operated by gas pressure. The battery consists of a 400-barrel elevated storage tank, 60-barrel metering tank shown at left and measuring and control instrumentation.

A Special

Pipe Line

Edited by
MELVIN A. JUDAH

EACH YEAR'S CONSTRUCTION jobs bring time and labor-saving advancements in the building of pipe line systems. Pipe laying in most terrain still involves the basic steps of welding, coating, lowering-in and backfilling. But special construction problems encountered in rocky, mountainous or marshy terrain and tough weather conditions spawn ingenious ideas by contractors and equipment suppliers.

In 1956, big-inch pipe lines were laid faster than ever before; one of the longest cross-country gas transmission lines was completed into the Pacific Northwest bringing gas service to the last major industrial section of the country not previously supplied; and there were many new developments in construction of offshore pipe lines. New dual purpose, weight-protective coatings were barge-applied for the first time. Early tests show that this material can protect pipe effectively and at the same time weight it with an elastic asphalt mastic heavy material.

New methods of laying lines both across bays and rivers point the way to continuing advancements in offshore pipelining. Each new submarine pipe line job brings forth new ideas to solve the special problems faced. With ever increasing reserves of gas and oil in the Gulf tidelands and other underwater areas these can mean real savings to pipe line construction in the future.

Operations brought new ideas, too. Automatic control and measurement is being incorporated in several remotely controlled pumping and compressor stations. Computers are solving pipe line engineering and design problems, products dispatching schedules, and many pipe line accounting problems.

Early 1957 will see initial operation of a long distance coal pipe line in Ohio. Pittsburgh Consolidation Coal Company will pump a coal slurry 108 miles through a 10-inch line to supply the Cleveland Electric Illuminating Company, from coal mines in southeastern Ohio. These developments point to many construction, engineering and operating advances for 1957.

PIPE LINE INDUSTRY Staff Report

Progress in 1956 Points Way for Future

New ideas in construction speed pipelaying in rugged terrain and tough weather. Automatic control advancements improve operations.

1. Automatic Custody Transfer Cuts Costs

DURING 1956 several pipe line companies began to receive crude from producers lease tanks by automatic custody transfer. Many different techniques have been tested including single and double weir measuring tanks and positive displacement meter batteries.

With the tank system, a fixed volume is delivered by measurement between high and low overflow weirs. Early tests show that tank units are accurate, reliable and economical in operation.

Latest development in automatic custody transfer was recently introduced by Stanolind Oil & Gas Company in Oklahoma. Stanolind's automatic system uses a 400-barrel storage tank mounted on an elevated base, a 60-barrel "metering" tank and gas operated float controlled automatic valves. Operation of the system does not require electric power.

Oil from the separator enters a large tank. A preset 31 day clock starts the day's runs by opening an inlet valve to the metering tank which then fills by gravity. When the level reaches the upper float of the metering tank, inlet valve to the metering tank closes, the outlet valve to the pipe line opens, oil temperature is recorded and an oil sample is taken in a small tank. All of these functions happen practically instantaneously.

A battery powered electronic "water cut" detector prevents bad oil from entering the metering tank. Oil is either automatically diverted back through the treater, or the lease may be shut down if oil quality drops below minimum requirements.

When oil level reaches the bottom of the metering tank, a counter registers one 60-barrel dump, an outlet valve closes and the inlet valve to the metering tank opens again to repeat the process. When oil in the main storage tank is too low to fill the metering tank completely, flow to the metering unit stops and the main tank refills until the preset clock next sets off the automatic process.

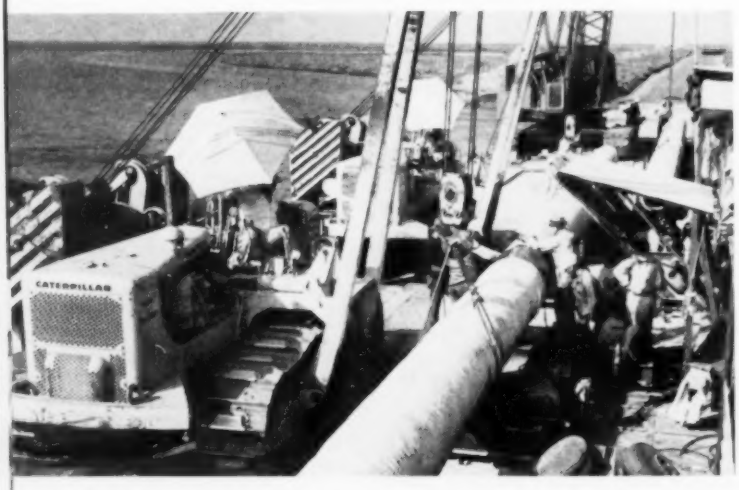
Using this system, pumper and gager can make visits to a tank battery once or twice a month and mix a stored sample of oil to determine average gravity and BS&W content of the oil run since the last check. Both then sign the run ticket which has the number of oil dumps delivered printed on it.

Primary consideration in application of automatic custody transfer is presently a matter of economics of operation, and acceptance by state regulatory bodies. Representatives of most of these state agencies, generally speaking, are taking a considerate view of the automatic custody transfer methods.

Real strides were made in automatic custody transfer during 1956. One of the big future advantages of automatic custody transfer may be in more efficient design of pipe line facilities. Automatic transfer may permit smaller diameter lines and fittings in design of systems to handle crude deliveries adequately.

Gager 'thiefs' oil sample from small pressure storage vessel when he makes his rounds once or twice a month.

2. Double Jointing Barge Speeds Marsh Line



Sideboom tractors move joints of 24-inch, 0.406-inch wall pipe to one of three double-jointing stations. After weld is completed, the double-joint may be either rolled forward on the second pipeway or picked up and moved by the two tractors. A double-joint lies on the storage rollers to the right of the crane, ready for line-up.

To COMPLETE the 355-mile long Muskrat Line of Tennessee Gas Transmission Company into the marshes of South Louisiana, contractors used a variety of new ideas. An outstanding one was the double-jointing barge of Williams Brothers using three pipe workways. On the inboard way, six joints of pipe were double jointed at three welding stations. From there double jointed sections were lifted to a transfer way where they were moved forward. At the forward end of the barge they were lifted by crane onto the forward station of a launchway. (See PIPE LINE INDUSTRY, July, 1956, Page 10.)

Line-up, stringer bead and filler pass welds were made at three stations on the launchway. This new technique enabled the Williams Brothers barge to make 85 to 90 joints per 12-hour day.

After welds were completed, the field joint was wrapped with polyvinyl-chloride tape and concrete coating was poured inside a plywood waterproof paper form. The form was then covered and banded and pipe was launched immediately off the rear of the barge.

3. Successful Satellite Station Sets Pattern

REMOTE-CONTROLLED UNATTENDED operation of Gulf Interstate's engine-driven centrifugal compressor station at Stanton, Ky., is leading the way for more stations of the same type. Operations are controlled remotely from a master station at Clementsville, Ky., 90 miles away. The operator at Clementsville can change the set point on a discharge pressure controller and, start and stop the engine at Stanton from his remote panel.

Reasons for the choice of design at Stanton were to find the combination of equipment that would be most economical, and at the same time safe, for unattended operation. Gulf Interstate's earlier stations were semi-automatic, having one operator per shift.

Sequencing for the automatic start up of the engine at Stanton and loading of the compressor is arranged so that failure of any event to occur will automatically stop the sequence. It will then have to be initiated again.

Sensing devices on each action are on the results of the action and not the particular function itself. For example, the main-fuel valve position is monitored by detecting the gas pressure to learn whether or not it is open or closed. Gulf Interstate engineers preferred this design over limit switches on various mechanical functions themselves.

Over 52 safety devices are used on the one unit compressor station. Devices cover vibration of various pieces of equipment, gas surges, breaks in pipe line, various operating pressures, temperatures, liquid levels, power failures, communication circuit failures, fire protection and other conditions.

To forestall the danger inherent in communications lines, Gulf Interstate's engineers designed the system so that the satellite station operation is independent of communications links as far as maintaining the last set value. Clementsville only changes the setting or the conditions, making the satellite to do all of its own controlling and trouble monitoring. The master station changes set condition such as discharge pressure, engine start up or engine shut down.

Construction is already under way on similar stations at Rapides, La., Humphrey and Alcorn, Miss., and Macon, Tenn. At each of these stations 3500-hp units will be installed and an additional 3500-hp unit will be added to Stanton. Controls for the entire setup will be at a master point mid-way along the Gulf Interstate system.

Gulf Interstate's satellite compressor station will soon complete one year of unattended remote mainline operation. Four more new engine driven centrifugal stations are now being built following the same design

At TGT's Mississippi River crossing south of New Orleans rubber-tired carrier on pontoon leads pipe into the water at proper angle. Crane on barge near midstream positions pulling cable to keep the line in a catenary on the bottom. Crossing was laid on a 14-degree angle downstream from each bank tangent to a large radius arc in midstream.

4. Mississippi River Crossing Pulled on a Catenary

TGT's Muskrat Line crossing of the lower Mississippi River marked another first. The 3200-foot crossing of 24-inch, 0.937-inch wall pipe was pulled on a catenary. Collins Construction Company used the continuous marine traffic method to lay the line in a natural catenary, bending 14 degrees downstream from each bank and tangent to a large radius arc at midstream.

From a rubber-tired launchway on the east bank of the Mississippi River, a 1600-foot section of concrete coated pipe was fitted with pontoons to give it a negative buoyancy of about four pounds per foot. Two such sections were pulled, using a diesel-powered winch on the west bank levee. A hold-back winch anchored 1700 feet back from the river's east bank kept the pipe section under proper back tension during the pull.

To make the pipe fit the catenary, a barge guided the towing head as it progressed across the river. Marine traffic into New Orleans continued over the line throughout the pull.

After the pipe was pulled across, fathometer surveys showed the pipe to have a maximum deviation of less than two feet from any point on the designed catenary. Immediately after location of the pipe was checked, pontoons were released and the pipe was buried to a depth of 12 feet by a jet trenching machine.

5. Pipe Lines to Carry Solids

Late 1956 saw construction near completion on a pipe line to carry coal from eastern Ohio coal mines through a 108-mile long pipe line to Cleveland. Pittsburgh Consolidation Coal Company will deliver 3400 tons of pulverized coal per day to the Eastlake power plant of Cleveland Electrical Illuminating Company.

Preliminary experience for designing the line was obtained from experiments by Pittsburgh Consolidation on a 17,000-foot loop utilizing 12-inch pipe. In the early studies, Pitt Consolidation determined optimum pumping pressures and slurry proportions.

When in operation coal will be finely ground and mixed into a pumpable slurry. Particles will vary in size from BB sized pellets down to fine dust.

Three pumping stations, each having three pumps driven by 450 hp motors, will move the coal slurry through the line. Heavy wall pipe is used to minimize the effects of internal erosion. Wall thicknesses vary from 0.375 to 0.687 inch for the 10¾-inch pipe line. Internal corrosion will be prevented by use of inhibitors to reduce the attack of sulfur compounds present in the coal. (See Pipe Line Industry, August, 1956, Pages 40-41.)

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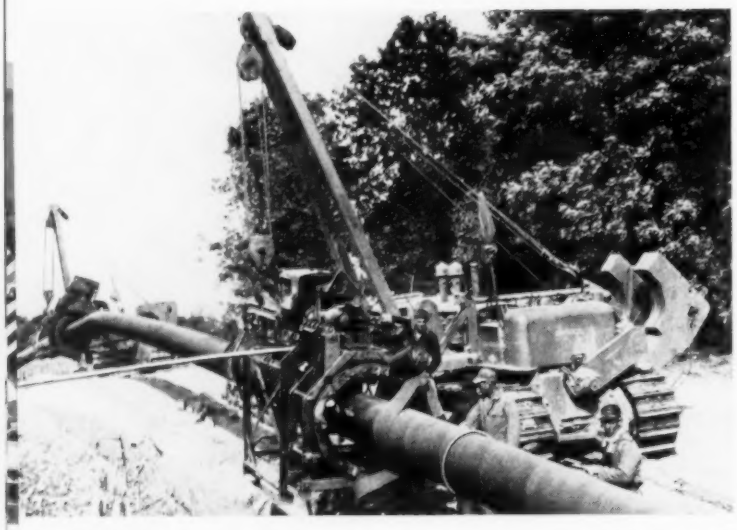
6. Taping Long Lines With Plastic



Polyethylene tape was applied with good success on the 122-mile, 22-inch line of American-Louisiana late last year.

Polyethylene tape application on the 122-mile long, 22-inch pipe line of American-Louisiana Pipe Line Company between Defiance, Ohio, and Bridgman, Mich., put plastic tape in service for long line protection. The entire line was wrapped with tape by machine methods.

Higher cost of the coating material was apparently largely offset by lower application costs resulting from savings in labor and equipment. Spread operations were kept tight and pipe was lowered into the ditch immediately behind the wrapping machine.

Daily progress on taping was as high as 9000 feet; tape wrapping gangs stayed close on the heels of the welding gangs.

Tape applied to the American-Louisiana line had a nominal thickness of 12 mils including 4 mils of adhesive. A heavier 20 mil tape with 5 mils adhesive was used on the heavy wall pipe laid at water and highway crossings. Minimum overlap was ½-inch and maximum lap was 1 inch. Much of the tape had nearly a maximum overlap.

Plastic tape is protected mechanically by an outer wrap of reinforced asbestos felt impregnated with coal tar. Tape was applied by power wrapping machinery which spirally wraps tape from two spools followed by two spools of glass reinforced felt. Contractors on the line were H. C. Price and Houston Contracting Company.

Speed of taping appears to be more than adequate for ordinary construction. There was little time lost in keeping materials available and only brief delays for changing rolls. Few holidays were found behind the wrapping machine so patching was a comparatively simple job—no more than five holidays per mile were detected. Future use of polyethylene tape promises good control of coating quality and high pipe protection.

7. Sea-Train Methods Speed Submarine Laying

In the first application of a new method of laying submarine pipe lines 4000 foot sections of 10-inch concrete coated pipe were towed across Corpus Christi Bay and tied in and welded overwater aboard a specially designed barge. The 60,000-foot submarine crossing was completed in only 80 working hours.

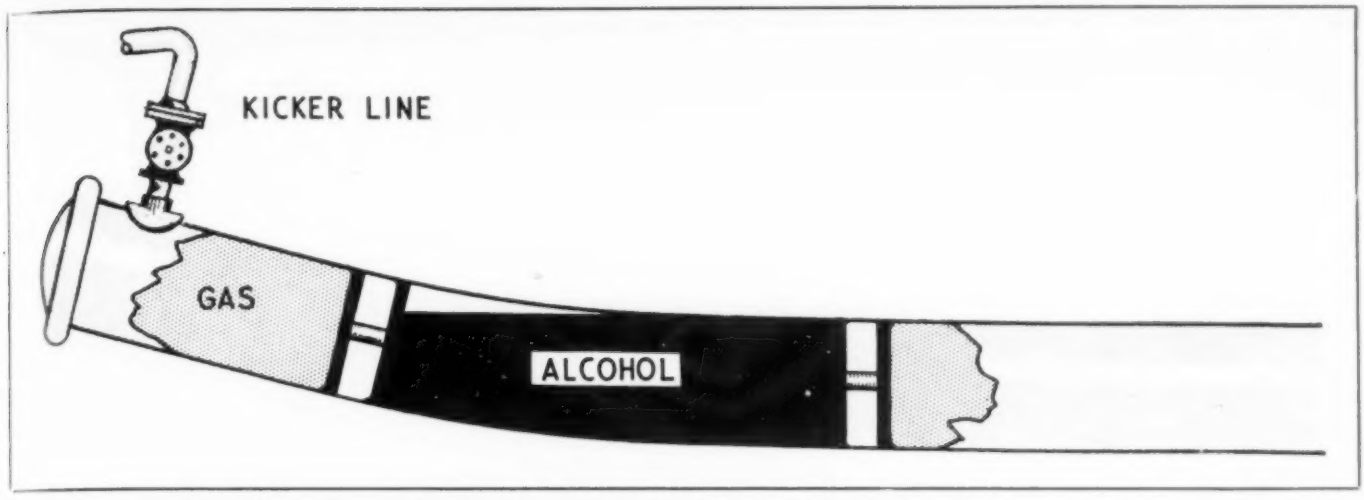
Fifteen sections were welded up on a shore launchway and towed into position in a fairway across the bay. Each section was kept afloat with pontoons suspended just below the surface until it was in position for laying along the right-of-way.

Tie-in welds were made on an anchored side-boom barge. Pipe was lined up and supported under positive control. As soon as welding was completed, pontoons were removed and the pipe was allowed to rest gently on the bottom.

Sections were towed at rates up to three knots, even in 2 to 3-foot seas. During construction of the Corpus Christi Bay crossing waves, stirred up by 30 to 40 knot winds, would have made barge laying particularly difficult.

The side-boom barge used for line up and welding supported pipe ends just above the surface of the water. Its four anchors were positively controlled from a central control panel to maintain proper breakover during tie-in. About half of the pontoons were left on each towed section until after the tie-in was completed. Each overwater tie-in required about three hours. After construction was completed, the pipe was buried by a jet trencher. (See Pipe Line Industry, October, 1956, Page 28.)

The floating string of pipe is towed into position near the tie-in barge anchored in Corpus Christi Bay. Average speed of the tow across the bay was about 3 knots.



'Rinse' of methyl alcohol put through a Transco loop after hydrostatic testing and pigging prevents freeze-ups later.

8. Methyl Alcohol Dries Gas Line After Testing

ON IT'S CURRENT expansion project, Transcontinental Gas Pipe Line Corporation again used hydrostatic testing on 36-inch loops. To eliminate any possibility of moisture causing later freeze-ups, loops were "dried out" with a slug of methyl alcohol between two pigs after hydrostatic testing and pigging.

This drying operation reduced dew points to a level below those observed in normal operations. In many cases, dew points of less than 5 pounds of water per Mcf were found after an alcohol run.

Quantity of alcohol placed in the line between the squeegees was calculated to be an amount sufficient to provide a thickness of 1 mil on the entire wall of the pipe in the section. Early experience indicates that this quantity of alcohol is particularly effective in eliminating freeze-ups following hydrostatic tests on cross country gas transmission lines.

Thorough pigging followed by a slug of methyl alcohol reduces dew-points to below normal after hydrostatic tests are completed on a new gas loop.

9. Ultrasonics Probe Submarine Pipe Routes

INSTRUMENTS USING high penetration ultrasonic vibrations are being used to survey the Gulf floor and learn the nature and depth of bottom sediments. Original research was directed toward offshore oil exploration but submarine pipeliners found the instrument useful in pointing the way for offshore pipe line construction.

The instrument called a "marine sonoprobe" was developed at the research laboratories of Magnolia Petroleum Company and used in surveying the route of Magnolia's lines off south Louisiana. This new tool is similar in construction and operation to conventional recording echo sounders used for measuring depth of water. Specially generated sound pulses have a much lower frequency and greater penetration power than conventional echo sounders. These pulses pass through bottom sediments and are reflected back from layers beneath the ocean floor.

Thicknesses of layers beneath are then displayed on a small picture tube and recorded as a continuous profile on paper. The instrument can be mounted on shallow draft boats for use in bays and marsh work or on larger vessels where sea conditions require. Experience so far indicates that it will be especially valuable in locating beds of oyster shells or other subsurface hazards to pipe line construction. It provides reliable maps of shallow salt domes, faults, buried channels and valleys, and shallow geological structures underneath the ocean floor, too.

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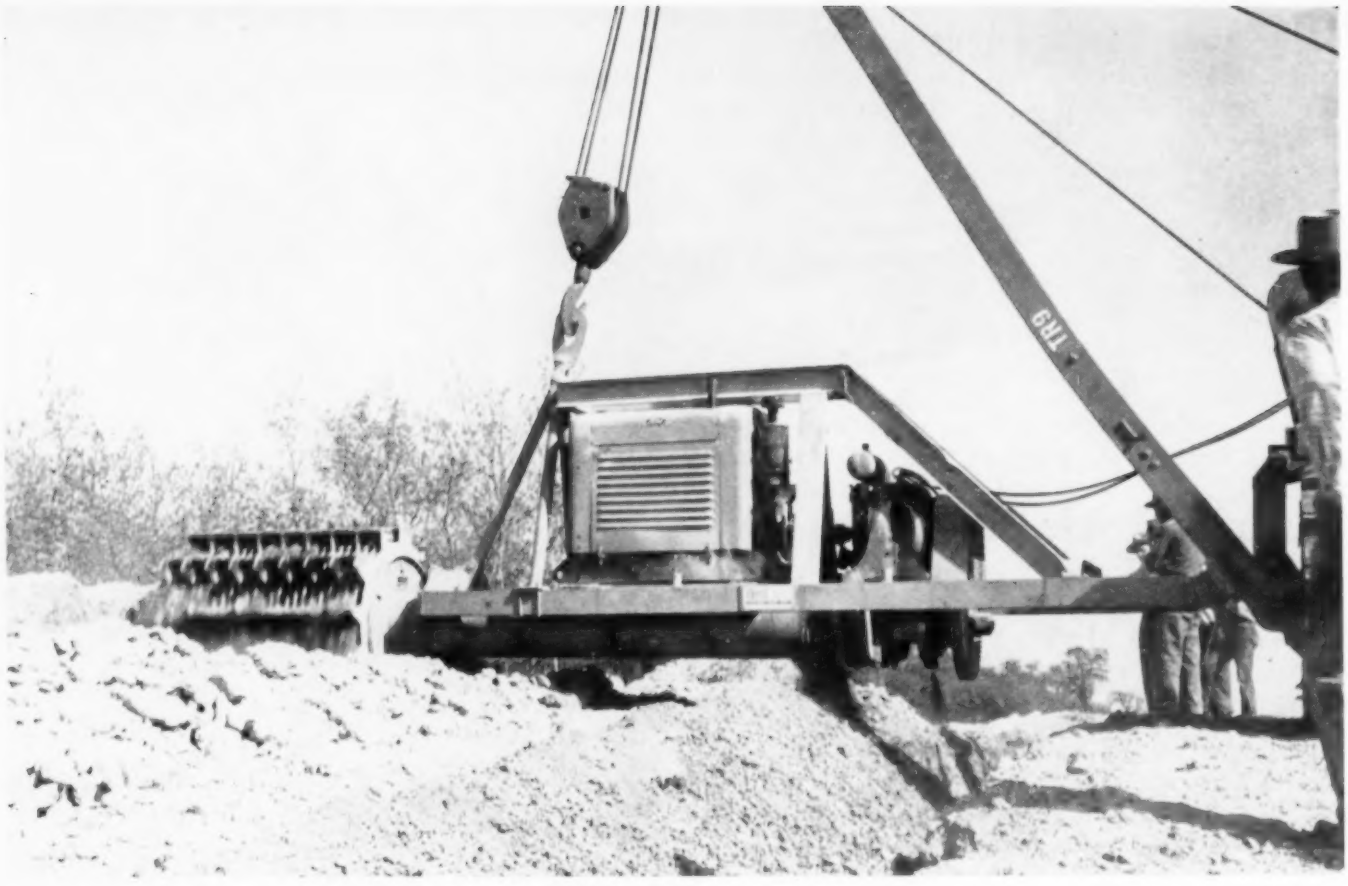


Rotary drum ditch-padder sifts rocky spoil bank at left to dump fines on pipe line. A simple pin attachment ties machine to standard sideboom tractors, and permits easy release. Doors on bottom of conveyor tube enable operator to distribute padding material at a variable distance from point of pickup.

10. Backfill Sifters Cut Padding Costs

LARGE MILEAGES of cross-country pipe lines that bored through rocky, mountainous terrain in 1956 brought about several innovations in protecting the pipe coating. Interesting U. S. development saw introduction of sifting machines to screen the spoil bank, place the fines around the pipe and then use the coarse spoil for the rest of the backfill. (See PIPE LINE INDUSTRY, October, 1956, Page 39).

The first backfill sifting machine introduced replaced 15 trucks used for hauling padding material on construction of 150 miles of 18-inch crude line for Sinclair Pipe Line Company between Jacksboro and Teague, Texas. River Construction Corporation, contractor on this initial test, made about 3000 to 3500 feet per day with the machine.

This sifter consists of a rotary sifting drum and auger conveyor. Steel rings spaced about two inches apart, reinforced with cross members, form the grid through which the fine backfill passes. Exterior of the drum is equipped with blades and teeth. Engine power is supplied through a torque converter. The entire unit is pinned and hinged to a sideboom tractor.

Soon after introduction of the revolving drum sifter, another machine was given initial field tests on El Paso Natural Gas Company's looping project in Arizona. It is essentially a modified ladder-type ditcher using two series of buckets, moving side by side. They ram into and pick up the spoil bank and then dump spoil onto a two-inch grid conveyor belt when they reach the top of their path. Another conveyor belt below the grid belt catches the fines which are carried over the ditch and deposited around and on the coated pipe. Coarse spoil backfills the rest of the ditch. Early experience shows that the padding machines can cut the cost of backfills in rocky country as much as 80 percent.

This backfilling machine is an adaption of a ladder-type ditcher that reverses the ditching process. It scoops up backfill, sifts it and dumps it on the pipe.

11. Digital Telemetering Gives Reliable Control

RAPID TRANSMISSION of operating data between remote stations and control points is vital in the automatic control of pipe line systems. New ideas in the technique used by Service Pipe Line Company promise good accuracy, reliability, quick utility for transmission or computation, and minimum communications channel needs.

Use of digital computers gives several apparent advantages over the time-pulse or analog method of data transmission to a single 1250 horsepower booster station on a 12-inch line near Hot Springs, Wyo.

The centralized control system for this station provides completely remote operation of the pumping unit. These values are telemetered back to the control point:

- Pumping unit on or off
- Suction valve open or closed
- Main breaker open
- Low suction pressure
- Communication circuit failure
- Station low air pressure warning
- Pump seal failure
- Current unbalance or overvoltage
- High pump case pressure, high case temperature, or high discharge pressure
- Pumping unit status (Motor overload, bearing, winding temperature, lube oil pressure, trip battery, low voltage, vibration, 20 psi air pressure alarm)

Each transmitter consists of a measuring system and an encoder. A typical pressure measuring system consists of a null balance, servo-operated indicator having a differenitial transformer positioned by the bourdon tube or bellows.

The encoder converts a shaft position into a digital output by means of 12 brushes that ride on a code plate having alternate silvered and insulated spaces on its surface. A binary code combination presents the measured variable in digital form.

Instruments at the satellite station initiate the transmission or operating information. The "silent dispatcher" is applied to discharge pressure and flow rate. Monitoring equipment is of the computer type, made up of relays and commutator with brushes.

Service's novel system solves many of the monitoring problems encountered on single or multiple lines having a number of satellite stations moving batched crudes at varying rates of flow.

12. Dual Purpose Coating Goes to Sea

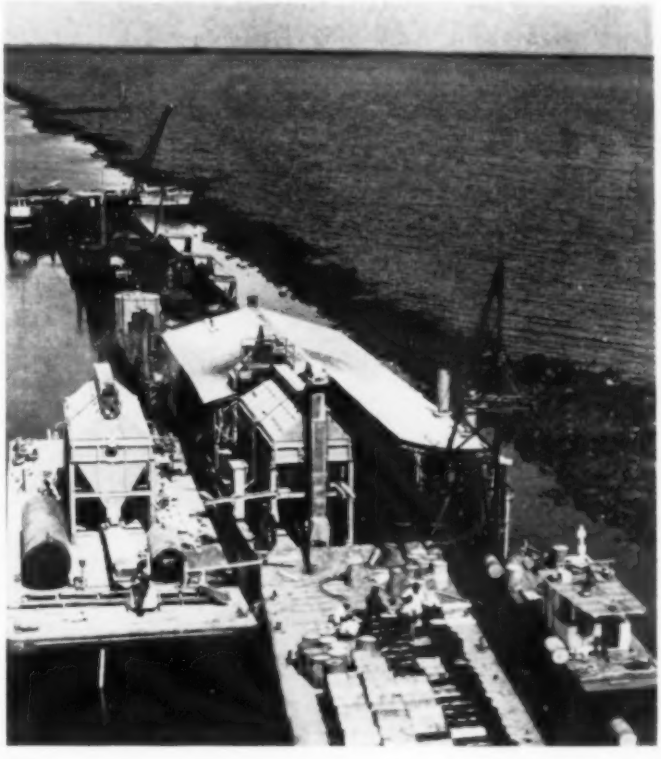
UNDERWATER PIPE LINES are now being given a quick barge application of dual purpose coating for both protection and weighting at rates limited only by welding progress. Initial field applications of the heavy-weight, asphalt-mastic coating have already been made on Southern Natural Gas Company's 12-inch pipe line near Lafitte, La. Brown & Root, contractor on the job, coated pipe at a rate of approximately 100 joints per day. (See PIPE LINE INDUSTRY, December, 1956, Page 20.)

Coating material consists of what is called a dry mix—a mixture of barite or limestone aggregates, filler, powdered asphalt and a powdered synthetic rubber. The dry mixture is prepared abroad a dockside mixing barge and then transported to the construction site by a hopper barge which shuttles back and forth.

Coating is applied on the lay barge continuously. Hot emulsified asphalt is added to the dry mix and blended to bring the material up to an application temperature of about 260° F. Shredded glass fibers are added into the coating just before application to give added physical strength. The hot mix is then extruded through a swage-shaped head onto the pipe. Extrusion pressure is applied by two screw-type feeder pumps.

The entire coating system is then given five seconds of vibration within the extrusion machine to compact the mixture to maximum density. Weight of the coating may be varied by the blending of the dry aggregate. For example, on a 12-inch pipe, a 1⅛-inch coating can be varied from 170 to 208 pounds per cubic foot merely by proper selection of aggregate and filler.

This new coating has enough flexibility to allow it to conform to any normal bend the pipe may be required to take. Pipe may also be lowered directly from the coating barge with no time delay for curing or cradling. Early service tests indicate a high resistance to marine life and a high electrical resistance.



New dual purpose weight coating barge in operation on Southern Natural's line in South Louisiana. —*The End*

Pipe line starts at Rota, in Southern Spain, and terminates near Zaragoza in mountainous Northeast Spain close to the French frontier. Of the 481 miles of line, 60 or more called for "blasting" for right-of-way ditching.

Cleaning machine makes its way along portion of line in some of the "easy" pipelining country. Majority of gang is composed of Spanish laborers including the two men on the "hoosier" pole.

U. S. Contractors Conquer Spanish Terrain

In building this new 481-mile line to connect a string of seven SAC jet air bases, American pipe line men had to use burros to haul ditch "padding." Rain, rocks and hurricanes were the toughest obstacles overcome.

By OMER ANDERSON
Bad Godesberg, Germany

IN SPITE of the damage to construction equipment at sea, rain, and granite mountain right-of-way, pipe was laid at the rate of 12,000 to 15,000 feet per day on the Spanish NATO line. A 1958 deadline has been set on the completion of the seven jet bases, and the connecting pipe line system. So the U. S. Navy's construction schedule to be met was rigid.

B & M Construction Company's spread ran into trouble early. A ship loaded with equipment from the U. S. sailed late because of a change in specifications, and ran into hurricane Diane last year. There was heavy damage to much equipment and some of that stowed topside was lost over the side.

Nature Seemed Set on Delaying Job. To add to the difficulties, several other pitfalls hindered progress:

- Pipe shape, and wall thickness of pipe, varied so widely that internal line-up clamps were used during laying.
- During the first six months, rainfall was about six times normal. Mud in southern Spain's flat lands slowed construction considerably. Time lost here, in supposedly 'easy' going, was made up by surprisingly good progress in the foothills and mountainous country to the northeast. Mountain work estimates called for 3000 to 4000 feet per day, while actual progress approached 6500 feet.
- Blasting demands exceeded estimates by over 100 percent. Specifications called for some 69 miles of padded line, actually padding was necessary on over 187 miles of the line.

This vital defense products line passes through every type of terrain, ranging from choice vineyards and olive groves in the southwest to granite mountains in the northeast of Spain. Mountains gave construction crews a nightmare of problems. Men were forced to use as many as 38 bits to drill a single hole in the granite to set a blasting charge for right-of-way or ditch.

Ancient Methods Meet Modern Specifications. In the mountains, ditch was padded with sifted backfill. Sifted backfill was supplied by construction methods traditionally Spanish. Dirt was hauled in by a train of over 100 burros, with 200 Spanish laborers screening the dirt through ¼-inch mesh screen over the ditch.

Burros actually learned to make the trip following a lead burro, and would lean or kneel to dump the dirt at the proper place over the ditch. Labor on the spread consisted of approximately 130 American pipe line personnel, who were key operators and supervisors, plus 487 Spanish laborers.

Sags and overbends were made using a bending-shoe on a side boom, as the use of a bending machine was deemed impractical. The line was cleaned, primed, and coated with a

Spanish laborers clean pipe to remove dust from primer before coating machine arrives. Some 487 of the laborers, plus 130 American operators and supervisors, made up the spread. A mobile construction camp of 60 house trailers followed the job.

Coating and wrapping machine made excellent time on the job. American operators were used for this job as well as most side-boom operations. Spanish "dope gang" picked up standard practices in short order.

coal tar enamel, glass fiber and asbestos felt, with approximately $^{3}/_{32}$-inch total thickness. When completed the line will be tested to 1600 pounds-per-square-inch pressure using jet fuel.

Unique Design Features to Fit Defense Plans. In connecting this chain of defense bases, the pipe line has several interesting features. There will be six diesel-electric pumping stations on the line, only four will be operating at normal load. Two stations will be "coasting," in order to slow down the velocity of fluid during a 2000-foot drop in altitude between Madrid and Zaragoza.

An important design feature in the over-all project, is the versatility of the line. As presently projected, the line will be capable of moving its displacements of jet fuel, aviation gas, diesel oil, and lubricants in either direction, from one base to another, with "batches" in the line at the same time.

All of the major air bases in Spain, to be used by U. S., will be tied in to the main line. Major fuel storage tank farms will be installed underground in several areas. An example of this is the installation at Jerez, where more than 70 tanks ranging up to 85,000 barrels in capacity, will be sunken underground.

Fluid will enter the system initially, from ocean-going tankers, at Rota on the southwest end.

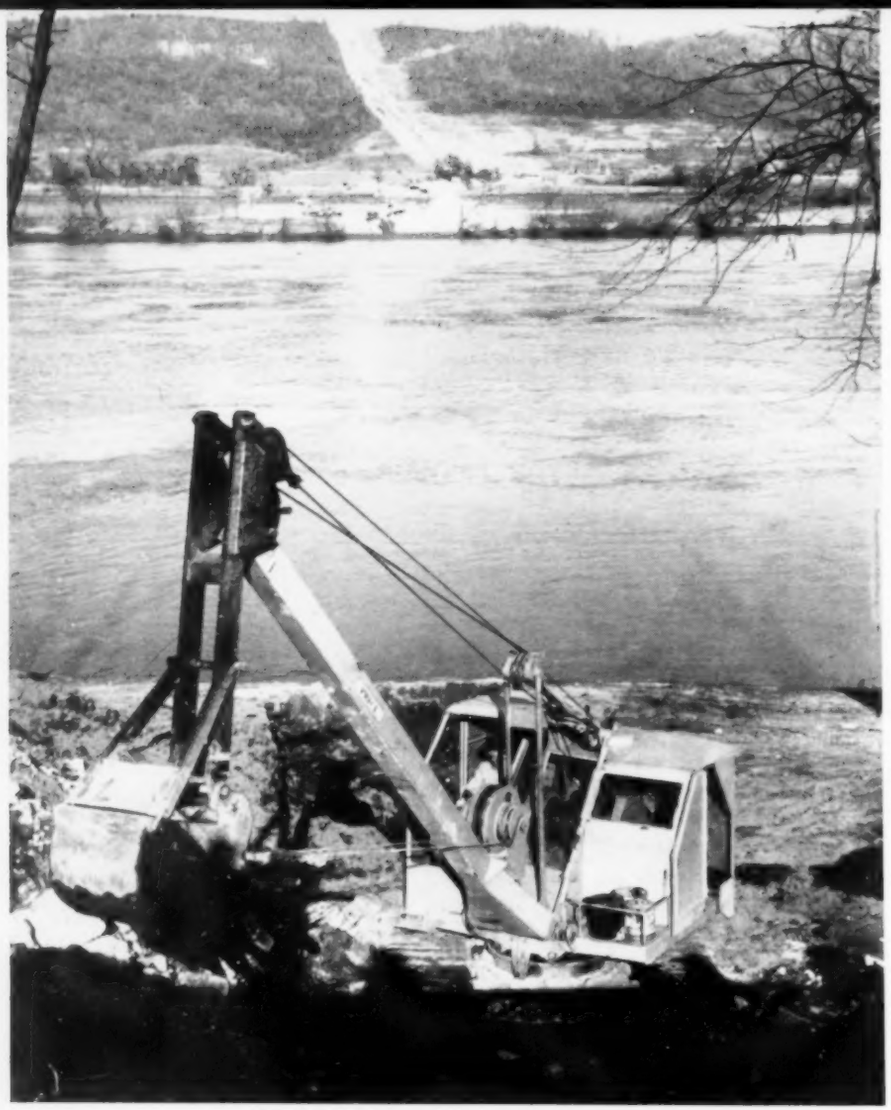
This pipe line is merely one phase of a chain of American defenses. Included in the over-all picture are to be such major installations as:

- A man-made harbor at Rota, six miles from Cadiz.
- A naval air station at Rota.
- Torrejon—headquarters for the U. S. base system, and a giant air base.
- The complete and separate bomber bases of Sanjurjo and Valenzuela, located 2300 feet apart near Zaragoza, 100 miles from the French frontier in northeastern Spain.
- Moron—SAC's southernmost bomber base, 30 miles southeast of Seville.
- San Pablo, northeast of Seville, which is to become the U. S. Air Force's great supply depot and maintenance center.

Rota will be the only major U. S. air facility on the European continent capable of landing and servicing carrier-based aircraft. Torrejon will have the world's largest reinforced concrete apron for heavy bombers. When completed the apron will measure 1100 by 8000 feet. The base's main runway will be 13,400 feet long—capable of accommodating anything the Air Force now has in the air or on the drawing boards.

The officer in charge of the project is Comdr. Robert E. Sparks, U. S. N. Contracting-engineering is a joint venture composed of Merritt-Chapman & Scott of New York, B & M Construction Corporation of Oklahoma City and Agroman Empresa Construccion of Madrid. B & M Corporation is the sponsor and manager of the project. —**The End**

Underground storage tanks for jet fuel were built near Jerez. Approximately 70 tanks will be in this particular "farm." Several other similar installations are tied in with the system.



Additional right-of-way width is required on river banks. Note cross country right-of-way in the background. Separate negotiations must be made for working space to complete crossing and for areas to deposit spoil from the river.

Right-of-Way Problems Are Everybody's Business

Acquiring rights-of-way for cross country lines has problems both for the engineer and the land department. Close coordination may provide "tailor made" solutions to fit specific needs.

By F. A. SMITH
Ford, Bacon & Davis, Inc.
New York City

RIGHT-OF-WAY PROBLEMS are management problems—not only of the Land department and the engineer, but of everyone working on a construction project. All pipe line companies may be affected by the actions of one. A hostile attitude can result directly in higher cost, delays and litigation for all.

At the inception of a transmission pipe line project, the engineer is first and foremost confronted with the location of the pipe line. He must take into consideration the shortest distance between points of origin and terminus, consistent with ability to construct and the economics of construction.

Preliminary location is generally aided by plotting the line on aerial mosaics. When these maps are available, all departments of the project can begin to function. The Land department can start the abstracting phase of the job, without delay for a preliminary ground survey. Close cooperation with the engineer must be maintained as later actual ground surveys might require relocations of the projected line.

Right-of-Way and Survey Go Hand in Hand. With abstracting complete, actual acquiring of right-of-way often begins before the preliminary survey is made. If not, the two operations can be carried on together; this is the best procedure. At this time each landowner must be contacted and his permission obtained for the proposed survey across his property. Permit men alleviate the problem and allow the survey party to proceed without unnecessary delays to explain their actions to landowners.

Preliminary Survey Leads Off. The engineer usually attempts to organize field forces and survey parties so alignment survey, crossing surveys, profile survey and soil test survey can be carried on simultaneously throughout the project. The control of parties and assignment of Land department permit men, must be directed by the engineer. He should indicate to the Land department the location of parties so that no party is without 'permitting' service at any time.

Clearing Way for Relocations. During actual preliminary ground survey, problems may be encountered

Lowlands like this give engineers trouble during survey and construction alike. Right-of-way men can run into difficulty satisfying width limitations, timber damage and surface restoration clauses.

promptly on the economic factors surrounding the request as a whole, and determine whether a negative decision will result in litigations. If it does, they must consider whether the increased time element will meet the construction schedule and what effect a court award would have cost-wise on the entire project.

Defined Descriptions Becoming the Rule. In the last few years a defined description as to pipe line location has become the rule, and not the exception. Formerly it was quite common to readily acquire what was known as an "open-end" easement: the traverse of the pipe line was not defined, but merely confined to a legal land description of the landowners entire tract.

Statutes, litigations, the use of attorneys, spiraling land values, past unfavorable experience with other pipe lines, and the subordination of existing or prior liens against the property now often requires a center line defined description. Many times

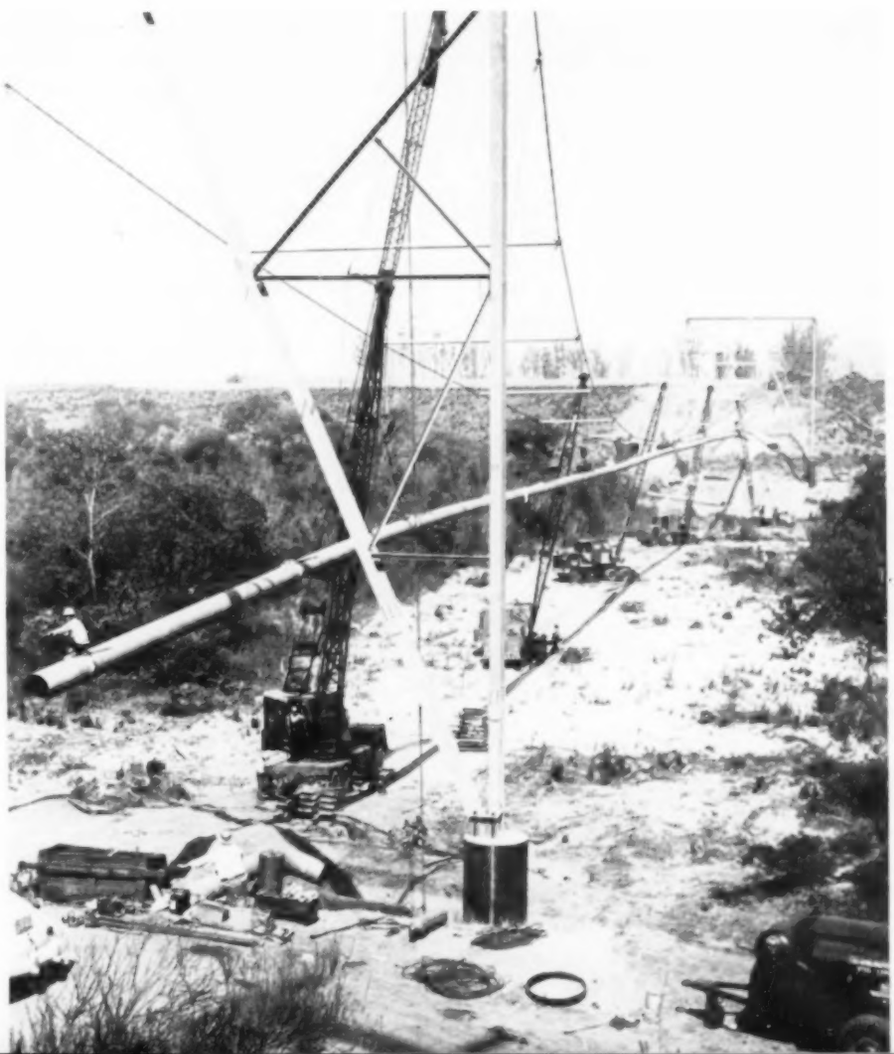
which require a relocation. Most common problems are ravines, marshes, 'common corners', river or railroad crossings, or prior rights for mining operations where a pipe line would interfere with removal of minerals. At river crossings and in marshes, additional right-of-way is often requested for working room. These problems may require relocation and abandonment of right-of-way already received, so economic consideration must be given to all the factors involved—costs of the new right-of-way, effect on abutting owners, costs of unrecoverable minerals versus the additional pipe line required, time to negotiate, and the exposure to possible additional right-of-way costs.

Very often, a landowner will insist upon a change of the traverse across his property, so that the construction and operation of the pipe line will interfere less with future planning or development of the area.

It is also possible that a portion of the property may be devoted to a certain type of cultivation that would not adapt itself to the presence of a pipe line. Ponds, lakes, dams, reforestation projects, drainage systems and the like, can all be causes of relocation.

The engineer and land department must work together to solve problems

Unusual construction such as this may involve both a term easement for the use of surface during installation and a permanent easement for the completed towers. Any future plans for development of the land must be given full consideration.



To hold costs for damage settlement down in country like this, construction schedules may have to conform to "harvest time" clauses. All-weather access roads to the right-of-way may be difficult to find.

a plat of the pipe line's traverse must be annexed to and made a part of the right-of-way easement and allied instruments.

These demands have greatly increased engineering costs in surveying and drafting to develop individual property plats. Requirements for a defined description and plat is a very definite cost factor, and may soon be required on every tract of land purchased. To expedite the acquisition, it is necessary for the engineer to promptly provide the land department with a plat adequate to satisfy the landowner or his legal counsel.

When buying right-of-way ahead of survey, description and plats will of necessity be scaled or approximated; it is then the engineer's responsibility to see that the line location be made in accordance with the described and plotted center line.

Past thinking on right-of-way grants was such that the engineer could relocate the pipe line on the property without having to resort to renegotiations. Frequent abuse of this practice resulted in the passing of state laws, rules, regulations, and statutes that preclude unrestricted use of the "open" easement.

A defined description helps the pipe line company in future expansion. It clearly defines a width of right-of-way traversing a property, giving notice to the world as to its width, its course, and bearings—encroachment thereon is easily determined. This factor aids the company in future looping or building. It also benefits the landowners as it is clearly defined and must contain his thinking for development of the lands, their sale or re-sale.

Special Provisions to Secure Easement. Provisions like these examples require prompt decisions:

- Tile, or a drainage system on the land, either installed or contemplated by the landowner requires extra depth of cover for the pipe line. Specifications may be written on the type of drainage repair.
- Traverse of the pipe line conflicts with proposed building sites or a planned subdivision.
- Farm ponds for livestock watering are often in conflict with the course and traverse of the pipe line.
- Special provisions for gates, fences, and their repair.
- Livestock control during construction—feeding, watering and herding problems.
- Time limit for construction. Engineering schedule of construction to conform with time limits.
- Necessity of specifying for buildings, or factories, heavy wall pipe and the like, or location at a sufficient distance to insure safety which may not be required under applicable codes.
- Provision of land leveling in rice farm areas—often involving the entire field.

All the foregoing factors, and many others, are of grave concern to the engineer, as well as the land department. The cost of the right-of-way where provisions are granted should be no greater than the cost to construct, and the several extra bills which might be required to provide

About the Author

F. A. SMITH was graduated from the University of Missouri in 1932. Early experience in the abstracting and real estate business fitted him well for right-of-way work. He entered into special right-of-way duties for Ford, Bacon, and Davis, Inc., in 1946 and has been with them since that time. Smith is an active member of the American Right-of-Way Association.

for the conditions incorporated in the easement.

Pipe Line Appurtenances May Involve Both Easement and Fee Simple Ownership. Special consideration must be given these problems:

- **Gate Valves.** The area required, the nature of the installation and its position. Extent above the surface of the ground; if it is to be fenced. This is usually an easement requiring a special plat as to location.
- **Side Taps.** The land department should be notified of the location of side taps as this, nine times out of ten, also indicates future right-of-way they will have to acquire on the property. It is usually an easement acquisition.
- **Regulators and Metering Stations.** This acquisition is normally a long time lease or a fee acquisition. Early definition of the area to be used by the engineer is vitally important.
- **Cathodic Protection Ground Bed.** This acquisition is generally in the form of an easement. Most installations vary somewhat in their areas of construction, often lying adjacent to the pipe line but not on the pipe line right-of-way. Rights must be acquired to install anodes and their connections, as well as right-of-way for the overhead electrical power line.
- **Property for Compressor Stations and Pump Sites.** Often, not only the fee property is desired but additional working space is desired for grading. Quite often, too, an access road is needed.
- **Telephone Lines and Radio Towers.** Sites must be acquired, as indicated by the engineering design.

These acquisitions are not at all unusual, but frequently sufficient information is not available to the land and engineering departments until after the project is well underway. This often results in unwarranted construction delays and increased cost of acquisition.

Progress Control of Acquisition is Vital. Control of progress of acquisition for rights-of-way is a must, both for the engineer and the supervisor of the land department. They must know at all times the status of progress and how it is affecting the construction schedule and cost estimates.

A weekly progress report is generally adequate, however, daily ones keep much better control of working assignments of personnel.

One good method of control is that of the graph line, whereby the engineer defines a line upon graph paper that fits into his schedule of acquisition. Then, if progress fails to reach this line during any given report period, immediate steps can be taken to add additional personnel.

Another choice is to reconsider the authorized roddage price on the basis of total cost exposure. If the actual progress exceeds the projected graph line, the construction schedule may be revised at a cost savings to the company.

This graph line should be substantiated by a progress report from the field showing rods or miles of daily acquisition and total acquisition to date. Proper administrative decisions can be based on this type of control, with the complete facts in hand.

Litigation Involves Land Department and Engineer Alike. Primarily, all petitions for condemnation must be supported by certain exhibits —generally land plats. This plat must show the traverse of the pipe line across property from the point of entry to point of exit, the course and bearings of the line, the width to be appropriated, corner ties to define the point of entry and the point of exit, and a center line description of the right-of-way.

The engineer must prepare himself to testify before the courts as an expert witness. He must be familiar with the matter of feasibility of location, economics of the location, complete laymen's explanation of the plats exhibited, plus a general knowledge of the corporate structure and its rights under certificate of necessity.

Alignment Maps Call for Full Cooperation. Land department personnel must supply certain information to the drafting department including: tract numbers, legal description of the lands traversed, full legal name of the last owners of record and scaled roddage by which acquisition was made.

These data will enable the drafting department to set up preliminary alignment maps to define property lines by legal description, and to check against field notes of survey parties. Actual survey distances give the land department a revised or rechained roddage basis for dealing with the landowner.

After the maps are prepared, the land department must check the data carefully, paying strict attention to the

Properly Planned Program Smoothes the Way

- Immediate contacts along every section of the line keep down rumors. This avoids public misunderstanding as to the purpose of the project and its anticipated effect on the community.
- The company's representative can direct educational efforts to the landowners, interested parties, and civic groups. This enables them to know the purpose, location, construction methods, and schedules. He can explain how the project will bring tax gains to the community. This will smooth the way for maintenance and operating personnel.
- Early evaluation of the acquisition program indicates areas of conflict with other projects, places of resistance where litigation may be required, and aids in the timing of good decisions.
- Advance thinking spotlights general trends early, points out where the right-of-way will be delayed, or completed first. In short, it is the factor allowing for human differences.

These data enable the engineer to plan construction schedules efficiently. He can negotiate contracts for construction to avoid shutdown time resulting from lack of right-of-way. Plans can be made fitting the engineering and construction to the acquisition program as it develops.

Location and acquisition problems may be simple in open range terrain. However, construction schedules may have to be altered to conform to specific "livestock problems" during blasting of the ditch.

tract identification numbers and the name, or names, of the legal titleholder. They must also make sure that the legal description of the land is correct to make certain that the right-of-way traversed has complete coverage so all chances of gaps or hiatuses in the right-of-way are eliminated. Chances of error are reduced to a minimum by cooperation between the two departments in checking the data required to complete the alignment maps. Maps are then ready for approval for construction.

Requirements of Regulatory Bodies. Permission from county, state and federal regulatory bodies is required in the acquisition of the following licenses, permits and easements: highway and road crossings, navigable river crossings, drainage districts and contiguous assessment districts, and state and federal lands, monuments, parks and forests.

All of these permits are best handled directly by the engineer, since he is dealing with other engineers in charge of the bureaus regulating the public or private properties listed. Drawings, and specifications as to type of construction are supplied to the engineering departments of the proper bureaus. The mechanics of value, and payments for easements or permits, are generally referred to the Land department, which follows through with the acquisition and provides the stipulations concerning restoration of the surface.

Construction Requires Right-of-Way Attention, Too. The Inspection department must be supplied fully with all right-of-way restrictions in the easement to properly identify the construction maps and to control the work of the contractors. To do this the Land department must supply the Engineering department "construction line lists" for use of the contractor.

This list identifies each and every tract of land crossed in proper order. It enables the contractor to be fully aware of special restrictions required on each tract. The Land department also should assist the engineer and contractor to expedite the construction of the pipe line. This may include making preliminary landowner contacts in advance to advise the landowners as to the time of construction.

During construction, the Land department acquires extra working space when required, obtains permission to use access roads, rents temporary storage areas, eliminates hazards by seeing that warning signs and lights are placed at road crossings and cuts, sees that temporary fencing and gates are kept closed, and advises the spread inspector of any negligence on the part of the contractors. Off right-of-way livestock and personal damage claims can thus be kept to a minimum.

On small jobs the Land department contacts landowners in advance to determine the type of cultivation and terrain to be encountered. They can advise the engineer of the time that crops will be planted or harvested, so that construction schedules conform to farming programs as much as possible. This way crop damage can be kept to a minimum.

Paying Construction Damages Does Not Finish the Job. This duty is a major responsibility of the Land department, and it is usually a long procedure. Two requirements affect final acceptance heavily:

1. Contractor's fulfillment of all special conditions indicated in the construction line lists and contained in the grants of easement.
2. Land department's responsibility for continuous landowner contacts after construction to keep down complaints and provide a resume of unsettled damage claims. Maintenance crews can thus be properly advised of existing conditions when they become activated.

Tailor-Made Right-of-Way Procedures Are Possible. It would seem then that it would be proper to establish a definite, well-outlined policy of procedure in that problems outlined here have a great deal of similarity wherever encountered. Applying past experience and study, a clear and practical standard procedure could be outlined, so that each problem would be classified. Decisions could then in a certain sense be tailor-made. With this degree of conformity of procedure all companies would benefit.

Almost all right-of-way problems directly affect the engineer. Cooperation and understanding is needed between the Land and Engineering departments for best results on any project. A Land department is not a burden to add greatly to an engineer's work load; it is a vital and important function of engineering itself. After all, you cannot build a pipe line, if you don't have a right-of-way to construct it upon.

ACKNOWLEDGMENT

From a paper presented at the American Society of Civil Engineers Convention, Pittsburgh, Penn., October 16, 1956.

Winter welding in Canada calls for wind screens, parkas, and a special breed of man. Here a weld is completed on the 34-inch line in Saskatchewan despite sub-freezing temperatures and biting prairie winds.

Trans-Canada Line Moves Eastward

Here is a pictorial report of early construction on the western section of the 2250-mile line from Alberta gas fields to Eastern Canada.

AFTER NEARLY TWO YEARS of delay, work is now well underway on Trans-Canada Pipe Lines' 2250-mile line to carry Alberta gas to eastern Canada. Late last year five contractors were working on the job; in spite of the U. S. steel strike at the start and weather difficulties during construction, work has progressed at a fast pace. Some spreads were making as much as two miles a day in country where a mile a day would have been considered good speed.

Trans-Canada officially got the "green light" to begin construction on the $378 million project on June 7th last year. Within days after the government approval, Trans-Canada's construction program was in operation.

Original plans called for seven contractors on the line, but when the U. S. steel strike cut back the supply of pipe, only two contractors began work; Majestic Contractors, Ltd., on spread one, and Canadian Bechtel, Ltd., on spread two. Not long after start of construction, Mannix, Ltd. and Dutton, Williams Brothers, Ltd., began clearing and grading right away on spreads three and four. Marine Pipeline and Dredging Company, Ltd. is completing two 34-inch river crossings of the Assiniboine River in Manitoba.

Prairie Work Went Smooth. Early work on spread one was through gently rolling farm and ranch lands of Western Saskatchewan. Some trouble was expected in ditching through the sand hills 25 miles east of Burstall, but little trouble arose. These hills had a good cover of native grass, scrub brush and trees with a thick matting of roots. Brush and roots made ditching progress slow but they did hold the white, fine grained sand in place.

To prevent cave in, ditching was held back to within a mile of the laying operations. A clam shell shovel cleared the ditch ahead of coating, wrapping and cradling. After construction Trans-Canada seeded the right of way through the sand hills with native grass and wheat to reduce sand drifting on the right of way.

Spread two, midway between Moose Jaw and Regina, encountered rolling terrain and many sloughs and water holes. In the sloughs and "pot holes" the 34-inch pipe was weighted with 6000 pound concrete weights to keep it buried.

One of the toughest locations on this spread was near Swift Current Creek, where the stream cut a wide ravine with 500-foot banks rising at grades greater than 45 degrees on either side.

Double Jointing Yard Speeds Pipelaying. To better control welding and speed construction regardless of the weather, Canadian Bechtel set up a semi-automatic welding yard at Morse to double joint the 40-foot lengths of 34-inch pipe. The double jointing yard was later moved to Archydal near Moose Jaw. Operations at the yard cut down the number of welders required on the line, reduced the handling of pipe on the right of way and provided good welding for all weather conditions.

Stringer beads and first hot pass welds were made by hand in the yard. Double joints were then rolled to an automatic submerged arc welding machine for the final automatic welds.

Trans-Canada leaders inspect spread progress near Moose Jaw, Sask. E. J. Mahoney (left), Bechtel Corporation's vice president for pipe line construction; C. S. Coates, Trans-Canada executive vice president and general manager, and Alberta's Premier E. C. Manning view late fall work.

During Trans-Canada's early winter work ground conditions varied from 'frozen solid' in the morning to muddy in the afternoon. Here the coal tar, fiber glass, and kraft paper protective coating system is applied in freezing temperatures.

Trans-Canada's line makes a dual 34-inch submerged crossing of the Assiniboine River near Miniota, Man. Here the first 260-foot section has been coated and wrapped, and weighted with 6000-pound river weights. Pontoons lashed to the pipe add buoyancy to the section during the fall.

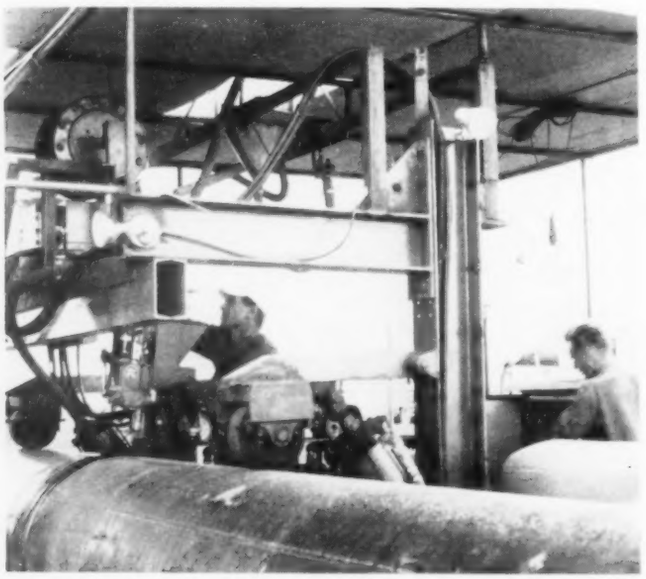
This machine made final welds at a rate comparable to four human welders. All double joint welds were x-rayed and inspected before being trucked to the right of way.

River Crossings Completed in Early Winter. Marine Pipe Line and Dredging Ltd. is making two crossings of the Assiniboine River in Manitoba, each crossing is approximately 1300 feet in length consisting of two 34-inch lines. The first crossing is at Miniota, Manitoba, and another five miles southwest of Portage la Prairie. At each, one pipe was welded, coated and wrapped and shielded with ship lap before 6000 pound concrete river weights were put on the pipe. Sections were then rolled into the water from dollies on rail type launchways on each side of the river.

Trans-Canada design calls for a 600-mile section of 34-inch line from the Alberta-Saskatchewan border to Winnipeg. The remaining 1150 miles between Winnipeg and Toronto will be 30-inch pipe; between Toronto and Montreal about 300 miles will be 24-inch pipe. The branch from Morrisburg to Ottawa will be 14-inch, and the Winnipeg to Emerson branch will be of 24-inch pipe. A 20-inch line is now in operation between Toronto and Niagara. The line is scheduled to reach Port Arthur at the Canadian end of the Great Lakes by the fall of 1957.

Design, engineering and management of construction on Trans-Canada line is being handled by Bechtel-Mannix-Hester, representing the pooled resources and experience of Canadian-Bechtel Ltd., Mannix Ltd., and Oklahoma Contracting Company.

—The End



Double-jointing yard speeds pipelaying in any weather on Canadian Bechtel's spread. At the yard stringer, bead welds were made manually and the 80-foot joints were rolled to this automatic submerged arc welding machine. Pipe rolls slowly as the weld is completed at a rate about equal to that of four qualified welders.

Surveyors break ice with dragline bucket to take soundings. Ditch for the Assiniboine River crossing was dug to a depth of 15 feet by draglines from the banks. Still water in the approaches froze solid before the pipe was pulled, so surveyors used the bucket as an icebreaker to check the ditch depth.

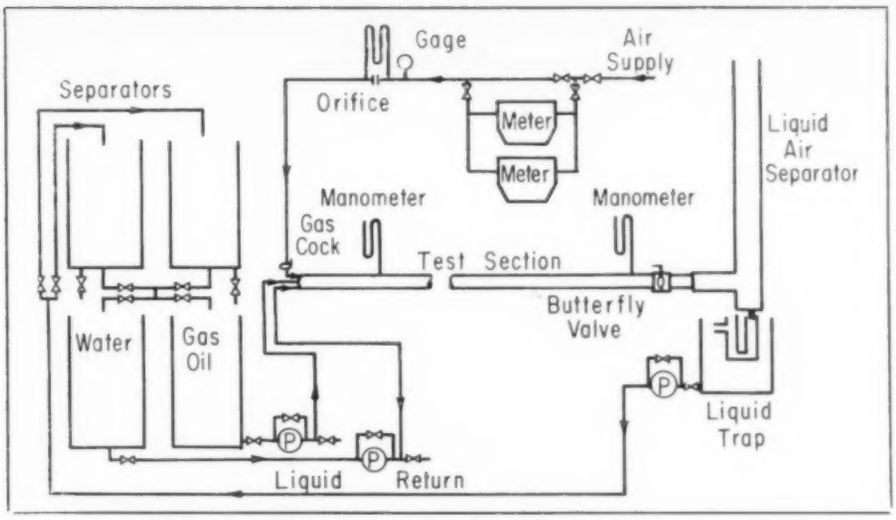


FIGURE 1—Flow diagram of test equipment.

Calculating Three-Phase Flow In Horizontal Pipe Lines

Tests covering a wide range of flow rates provide valuable pressure drop data for these complex systems.

By D. P. SOBOCINSKI* and R. L. HUNTINGTON
University of Oklahoma
Norman, Okla.

MANY PIPE LINE operations encounter special conditions where two or three-phase concurrent flow of fluids occur. It may be in the transportation of gas, crude, or condensate and water from the offshore wells; or when glycol is injected into a gas pipe line with oil and wet gas to prevent hydrate formation and freeze ups. To design the best piping systems, engineers have long needed better pressure drop data to avoid the difficulties and errors of trial and error solutions.

Earlier studies of vertical piping[1] with flowing oil, gas, and water provided valuable data. These led to the current laboratory study seeking the answers for concurrent flow of oil and gas in horizontal pipe lines where injections of a third phase such as glycol takes place.

The experimental assembly for the flow tests was set up as shown in Figure 1. A 3-inch diameter 38.16 foot length of clear plastic pipe was mounted horizontally to serve as the test section. Other equipment included storage tanks for water and gas-oil, pumps, manometers, gas-liquid separator, and a quick-closing valve.

This valve located near the outlet end of the piping was used to obtain the inplace ratio of the several fluids. Flowing rates and pressure drops were measured also.

Physical properties of the water and gas-oil are given in Table 1.

During the tests colored 16-mm motion pictures were made of typical runs showing the various flow patterns which took place under a wide range of fluid ratios and flow rates. This silent film requires 12 minutes of projection time.

Two-Phase Runs Show Liquid Holdup. Several runs were made on air-water and air-gas oil systems to obtain liquid holdup characteristics for two-phase concurrent flow in the plastic pipe.

Liquid holdup data on air-water and air-gas oil flows are shown in Figures 2 and 3, respectively, for a fairly wide range of flow rates. Slug flow was not included in these experiments. From previous laboratory work,[2-4-5] the results proved to be in line; the more effective sweep of liquid from the pipe occurred at higher air velocities.

Three-Phase Runs Determine Flow Patterns. To reduce three-phase experimental runs to a limited number, only a few fixed mass-liquid rates and flowing ratios of water to gas-oil were studied. For each water-to-oil ratio, air rate was varied over as wide a range as possible with the equipment used.

First tests were made with a water to gas-oil flow ratio of 0.66. Total mass-liquid rate was 34,100 pounds per hour per square foot.

At an air rate of 2000 pounds per hour per square foot of open tube area (see Figure 4) the gas-oil flowed on top of the water at approximately 150 percent of the linear velocity of the water. Up to this air rate, there was no visible disturbance in either the boundary layer between the air and the gas-oil or between the gas-oil and the water. The flow pattern was called stratified.

When the air-mass velocity went about 2000 pounds per hour per square foot, gentle ripples appeared on the surface of the oil; however,

TABLE 1
Physical Properties of Water and Gas-Oil

COMPONENT	Density	Viscosity	Surface Tension
Water[2]	62.3 lb./cu. ft. at 70°F.	0.68 centistoke at 100°F.	72.9 dynes/cm. at 70°F.
Gas-oil	36.8 API 60/60	3.38 centistokes at 100°F.	23.5 dynes/cm. at 95°F.

* Author Sobocinski's present address is Department of Chemical Engineering, University of Kansas, Lawrence, Kansas.

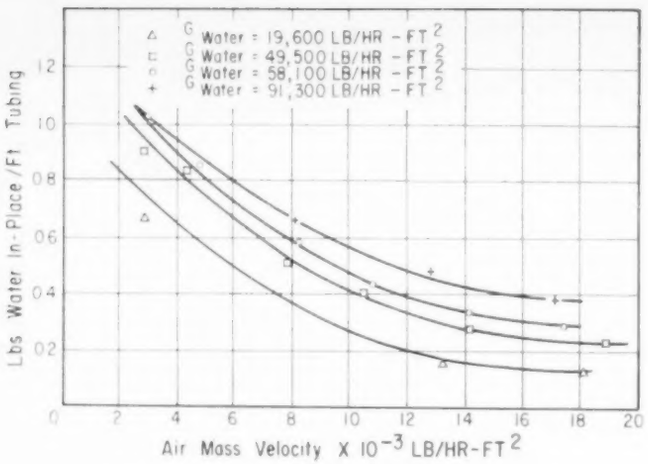

Water = 19,600 LB/HR - FT 2
Water = 49,500 LB/HR - FT 2
Water = 58,100 LB/HR - FT 2
Water = 91,300 LB/HR - FT 2
Lbs Water In-Place/Ft Tubing
Air Mass Velocity X 10-3 LB/HR-FT 2

FIGURE 2—Water holdup for various air-flow rates.

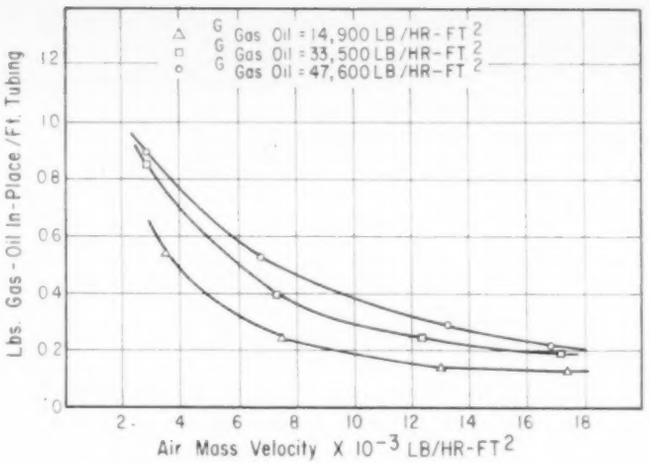

Gas Oil = 14,900 LB/HR-FT 2
Gas Oil = 33,500 LB/HR-FT 2
Gas Oil = 47,600 LB/HR-FT 2
Lbs. Gas-Oil In-Place/Ft. Tubing
Air Mass Velocity X 10-3 LB/HR-FT 2

FIGURE 3—Gas-oil holdup for various air-flow rates.

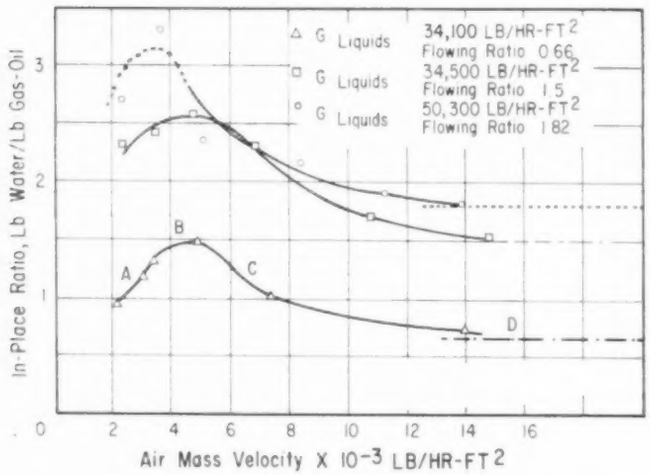


FIGURE 4—Relationship of in-place to flowing ratios of water to oil.

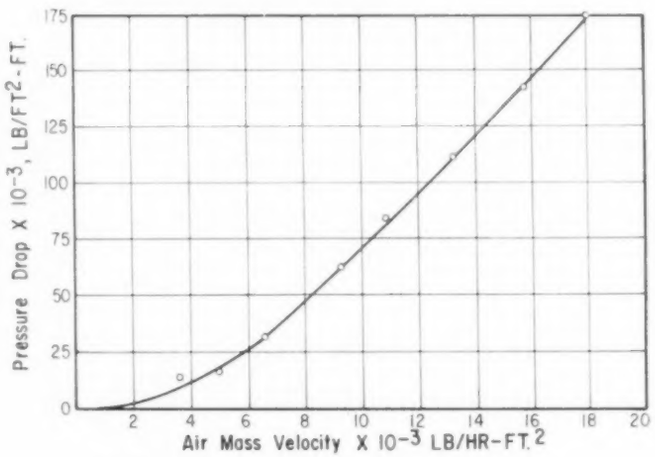


FIGURE 5—Frictional loss for various air-flow rates.

the surface between the oil and the water remained smooth. The linear velocity of the oil had increased to 227 percent of that of the water. With air velocities of 3000 to 4000 pounds per hour per square foot deep ripples developed on the gas-oil surface and minor irregularities appeared between the gas-oil and the water.

At an air-mass velocity of 4600 pounds per hour per square foot waves appeared on the surface of the oil and also between the oil and the water causing incipient emulsification. As the air flow was increased to higher and higher rates the ratio of water to oil in place decreased from 1.5 maximum and emulsification became more nearly complete.

Higher Air Rates Give Semi-annular Flow. Results of other liquid-flow rates and ratios are shown in Figure 4 with the same type of curve for varying air rates. As the air rate was increased from 5000 up to 12,000 pounds per hour per square foot, the emulsion became more pronounced and gradually encroached up the sides of the pipe walls forming a continuous film around the entire inside periphery of the tube. However, the amount of frothy emulsion in the bottom of the tube appeared to be greater than it was in the layer along the sides or top of the tube. The flow pattern could be classed as a semiannular.

At an air velocity of 14,000 pounds per hour per square foot the in-place ratio of the two liquids approached the flowing ratio.

When total liquid flow reached 35,000 to 75,000 pounds per hour per square foot, the conduit contained more liquid in place and ripple flow was reached sooner. A similar action occurred for emulsified flow as the air mass velocity was increased due to the smaller cross-sectional area through which the air had space to flow.

Higher Water-To-Oil Ratio Increase Frictional Pressure Drop. Several similar series of experimental runs were made with 1.5, 4.0, 6.0 and 8.0 water-to-oil mass-flow ratios. Increasing the air-flow rates for each of these liquid-liquid ratios caused the most pronounced oil-in-water emulsion formation at a water-to-oil mass-flow ratio of 4.0.

This emulsion was temporary in nature as it settled out within a few minutes when caught in a vertical three-inch sampling cylinder. Within the tube, however, the emulsion took on the appearance of frothy suds, its large irregular surfaces serving to increase the frictional pressure drop.

Measurement of Frictional Losses with Single and Two-Phase Runs. Pressure-drop data were obtained on air flow only, water-air, and gas-oil-air flows to give a more complete comparison of different types of flow systems. Slug flow was not included.

Air flow only is presented in Figure 5. Water-air flow data are shown in Figure 6 for a range of water rates

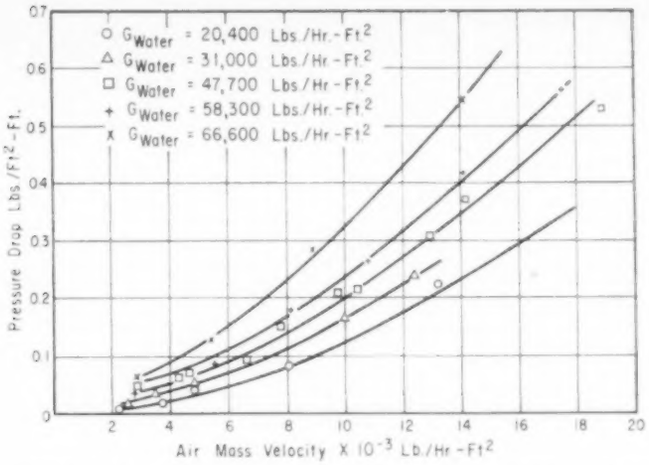

○ G_{Water} = 20,400 Lbs./Hr.-Ft.^{2}
△ G_{Water} = 31,000 Lbs./Hr.-Ft.^{2}
□ G_{Water} = 47,700 Lbs./Hr.-Ft.^{2}
+ G_{Water} = 58,300 Lbs./Hr.-Ft.^{2}
x G_{Water} = 66,600 Lbs./Hr.-Ft.^{2}
Pressure Drop Lbs./Ft.^{2}-Ft.
Air Mass Velocity X 10^{-3} Lb./Hr.-Ft.^{2}

FIGURE 6—Frictional losses for flows of water from 20,400 to 66,600 pounds per hour per square foot and for air from 2,000 to 19,000 pounds per hour per square foot.

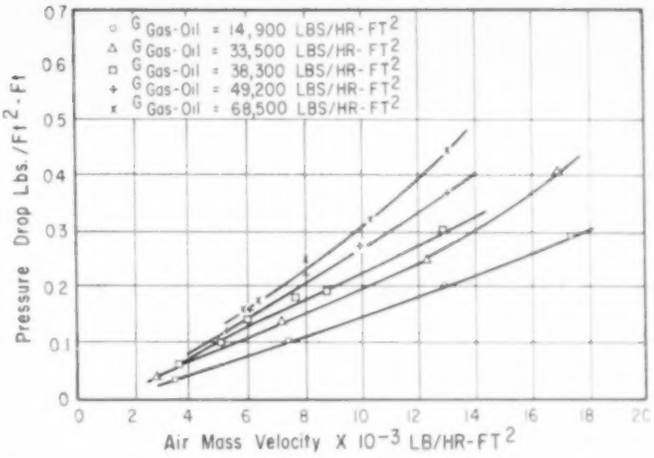

○ $G_{Gas-Oil}$ = 14,900 LBS/HR-FT^2
△ $G_{Gas-Oil}$ = 33,500 LBS/HR-FT^2
□ $G_{Gas-Oil}$ = 38,300 LBS/HR-FT^2
+ $G_{Gas-Oil}$ = 49,200 LBS/HR-FT^2
x $G_{Gas-Oil}$ = 68,500 LBS/HR-FT^2
Pressure Drop Lbs./Ft.^{2}-Ft
Air Mass Velocity X 10^{-3} LB/HR-FT^2

FIGURE 7—Frictional losses for air-gas-oil flows from 14,900 to 68,500 pounds per hour per square foot.

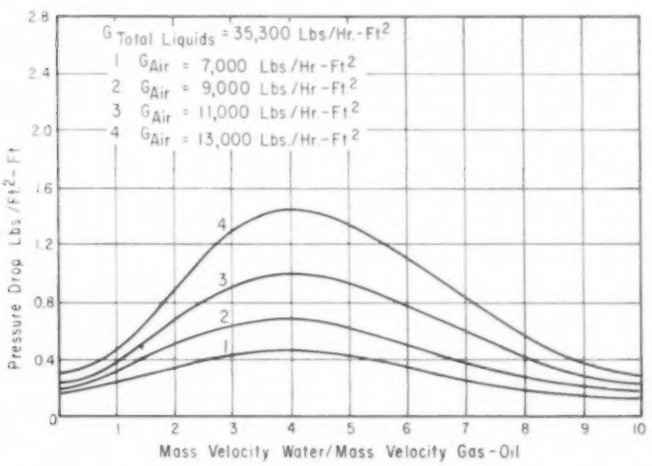

$G_{Total\ Liquids}$ = 35,300 Lbs./Hr.-Ft.^{2}
1 G_{Air} = 7,000 Lbs./Hr.-Ft.^{2}
2 G_{Air} = 9,000 Lbs./Hr.-Ft.^{2}
3 G_{Air} = 11,000 Lbs./Hr.-Ft.^{2}
4 G_{Air} = 13,000 Lbs./Hr.-Ft.^{2}
Pressure Drop Lbs./Ft.^{2}-Ft
Mass Velocity Water/Mass Velocity Gas-Oil

FIGURE 8—Frictional losses related to various water/oil flowing ratios.

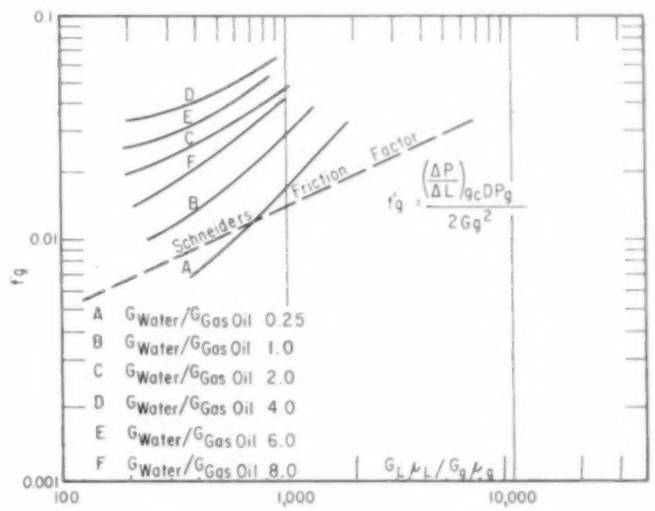

Schneider's Friction Factor
$f'_g = \frac{\left(\frac{\Delta P}{\Delta L}\right) g_c D P_g}{2 G_g^2}$
f_g
A $G_{Water}/G_{Gas\ Oil}$ 0.25
B $G_{Water}/G_{Gas\ Oil}$ 1.0
C $G_{Water}/G_{Gas\ Oil}$ 2.0
D $G_{Water}/G_{Gas\ Oil}$ 4.0
E $G_{Water}/G_{Gas\ Oil}$ 6.0
F $G_{Water}/G_{Gas\ Oil}$ 8.0
$G_L \mu_L / G_g \mu_g$

FIGURE 9—Attempted correlation of three-phase flow data with Schneider's friction factor for two-phase flow.

from 20,400 to 66,600 pounds per hour per square foot and for air from 2000 to 19,000 pounds per hour per square foot. All are based on open-tube area. Gas-oil-air was the other two-phase system studied for pressure-drop data. (See Figure 7). The results conform with previous experimental work[3,4,5] on smaller plastic pipe.

Three-Phase, Pressure-Drop Data Show Physical Properties of Liquid Has Little Effect. As pointed out earlier emulsification appeared to be most intense when the mass ratio of water to gas-oil was about 4.0 regardless of the air rate. By cross-plotting the pressure-drop data for a number of runs as shown in Figure 8, the maximum frictional loss also takes place at this particular ratio.

The two-phase pressure drops for water-air and gas-oil-air systems appear to be substantially equal for the same total mass of liquid and air. In other words, the physical properties of the liquid components appear to have little effect on frictional loss for the flow range studied in these two binary-phase systems.

Several Types of Emulsions Formed. Up to a mass ratio of water to oil of 4.0 or a volume ratio of 77 to 23, temporary emulsions caught in a clear cylinder at the outlet of the tubing were water dispersed in oil. The oil phase upon separation remained cloudy while the water phase cleared up quickly. Beyond this critical mass ratio of 4.0 (water to oil) the emulsion was oil dispersed in water.

Although no viscosity measurements were made on these temporary emulsions, it could be seen readily that they were non-Newtonian in nature. The frothy emulsion formed took on more the appearance of solid irregular shaped flakes than that of a fluid material.

Correlation With Two-Phase Flow. An attempt has been made to correlate the three-phase gas-oil-water-air flow data with the friction factor plot of Schneider[1] as shown in Figure 9. The formation of frothy emulsions of various intensities caused wide deviations from this empirical relationship.

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[1] Poettman, et al., API-Mid-Continent Production Division, March, 1952.

[2] Data obtained from "Chemical Engineers' Handbook," edited by J. H. Perry, McGraw-Hill Book Company, Inc., New York, N. Y., third edition, 1950.

[3] "More Data on Two-Phase Vertical Flow," by W. C. Galegar, et al., Petroleum Refiner, vol. 33, November, 1954, pp. 208-211.

[4] "Horizontal Two-Phase Oil and Gas Flow," by F. N. Schneider, et al., Pipe Line Industry, vol. 1, October, 1954, pp. 47-51.

[5] "Horizontal Co-Current Two-Phase Flow of Fluids in Pipe Lines," by P. D. White and R. L. Huntington, *Petroleum Engineer*, vol. 27, August, 1955, pp. D46-D45.

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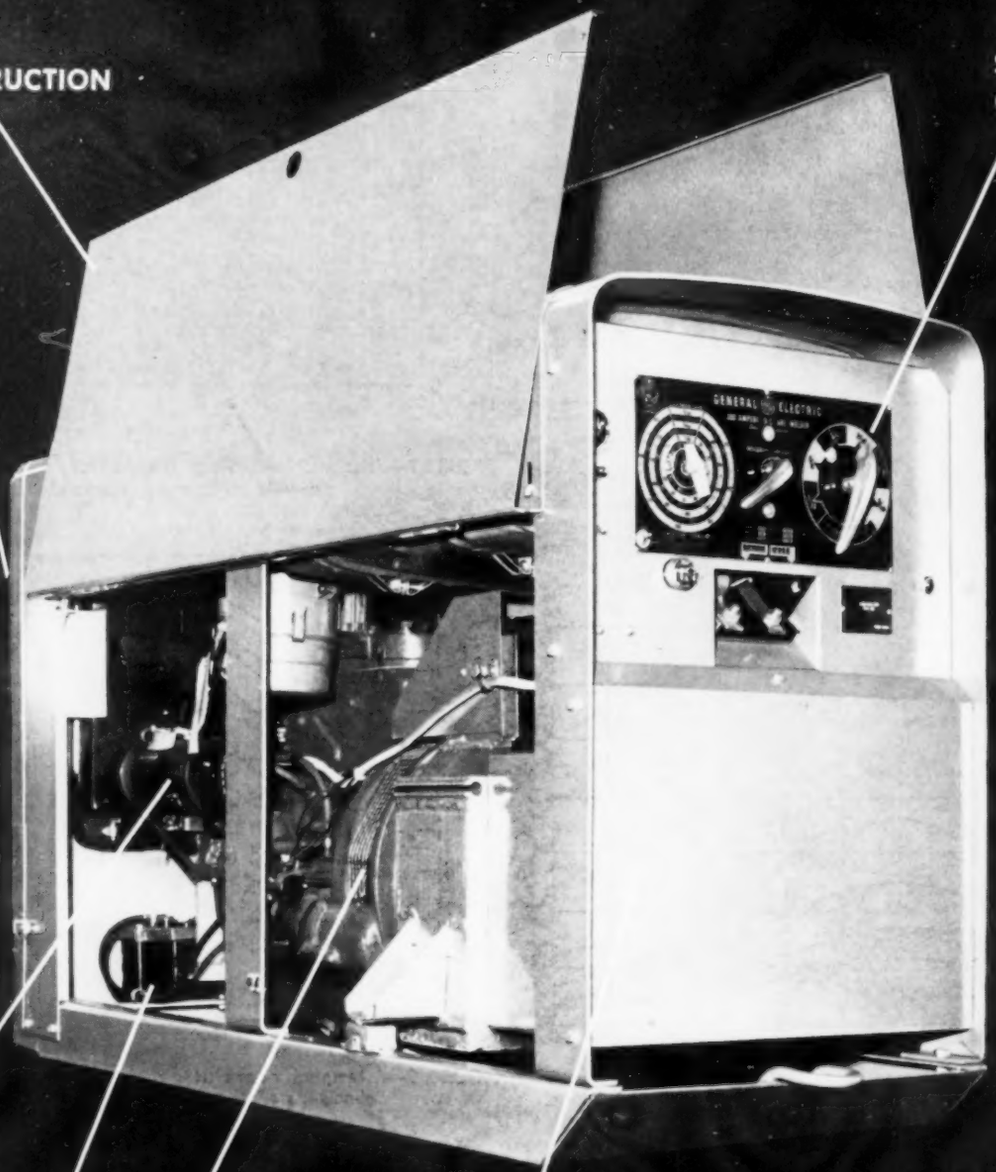

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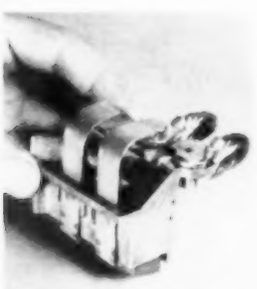
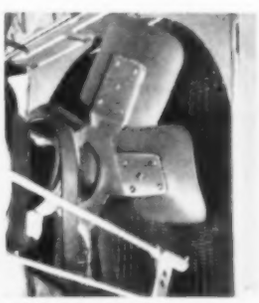


CONSTANT-PRESSURE Brush Springs—Right pressure maintained for life of generator brushes without adjustment.

PRELUBRICATED Generator Bearings—Ball bearings prelubricated with sufficient grease for years of service.

DEPENDABLE Geared Governor—Gear-driven governor maintains close speed regulation for best welding.



PUSHER-TYPE Engine Fan—Large diameter pusher-type fan circulates ample cooling air for engine and generator.

CONTROLLED CURRENT Peaks—Current peaks are controlled. Arc can be crowded with no "stumbling" or "freezing."

	✓	✓	✓	✓	✓
		✓	✓	✓	
				✓	

SPREAD BOSS GETS THROUGH—Using radio, Superintendent Clarence Shivel, of H. C. Price Company gets quick work and action from any part of the spread.

Spread Radios Speed Modern Pipe Laying

Instant communications between spread boss, foremen, engineers, and the field office save hours of time during construction. Here is a handy guide for the maintenance of radio equipment.

DURING A BUSY construction schedule, communications traffic controlling the spread sounds a lot like the voice orders given a fighting combat unit. Two-way radio systems have developed with other advancements in pipelining to a point where good operation is often taken for granted. Yet it is hard to imagine how a dispersed spread could make fast progress laying a pipe line without use of radio.

By voice communications essential working information is quickly relayed to all points on the spread: equipment maintenance and service can be anticipated and handled efficiently; testing and pigging of lines is better controlled, and rapid reports of injuries or accidents promote safety.

Today, modern pipe line contractors are leading the way in application of two-way radio in construction work, but this leadership did not happen overnight. To give just one example, ten years ago the H. C. Price Company installed a two-way radio system on one spread in an attempt to overcome tough communications problems. This network has grown until Price now has 115 radio-equipped vehicles and five base radio stations, one for each of five working spreads.

Let's take a closer look at applica-

tion of radio to a typical Price spread which completed 135 miles of line on the American Louisiana Pipe Line Company gas line. Spread Three used 26, two-way radio units—25 mobiles plus one base station located at the field office trailer. All units have 60 watts RF power output and operate under FCC Special Industrial License on a frequency of 30.62 megacycles. Good communications were maintained between mobile units operating as far as 20 to 30 miles apart.

The field office manager handles a good portion of the radio traffic. Yet, as much as 80 percent of the traffic is between the mobile units out on the spread.

Mobile units are mounted on each of 15 pickup trucks, 2½-ton truck, fuel supply truck, Lo-Boy, two-ton grease truck, flat-bed float truck, general utility truck, two smaller vehicles, a one-ton truck used by the master mechanics and in the spread superintendent's car.

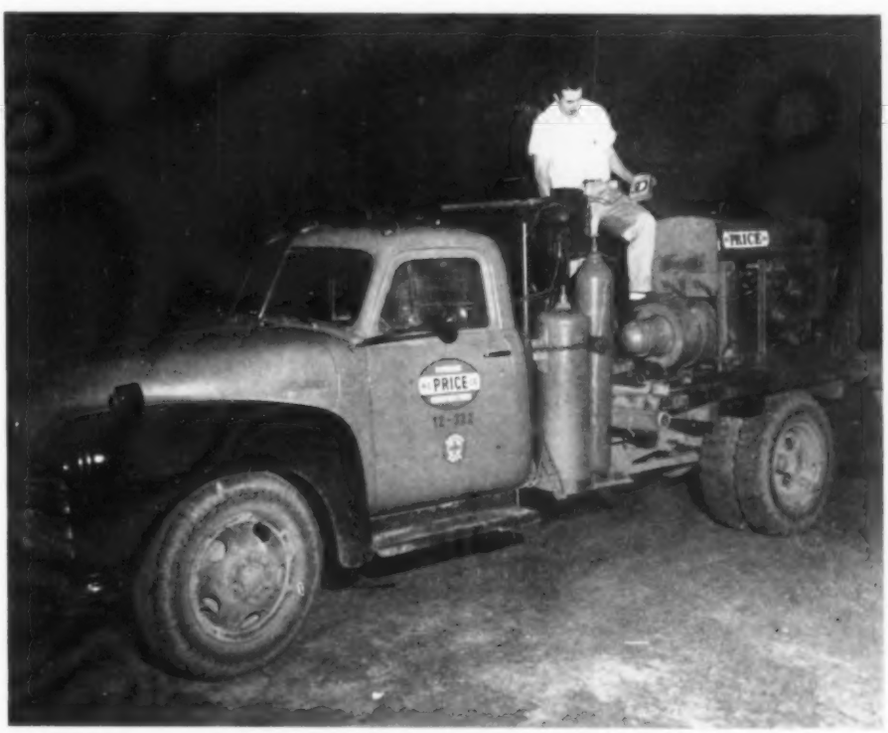
Normal Price Company procedure calls for the safety engineer to lead the way in construction to spot possible hazards. At the same time he negotiates with farmers and landowners for access roads and handles special right-of-way problems. Mobile radio can be a real safeguard in the event of injury in the field, and coupled with a well-conducted safety program it is responsible for the excellent safety record established by pipe line contractors.

On a job, the two-way radio allows the superintendent, foremen, engineers and field office to communicate directly and instantly at any time even when they are widely separated. This permits quick solutions to routine problems and assures that work is smoothly coordinated when special situations arise.

Radio coordination of the spread utilizes the working force to the maximum; avoiding a shorthanded situation at one place while men are temporarily idle at another.

Maintenance and repair are speeded up, too. When equipment breakdowns occur in the field needed help comes in minutes instead of hours. After spotting the trouble, mechanics order parts from the field by radio through the base station. A

Radio saves time and labor by keeping field office and field personnel in close contact. Here, Buck Bowan reports on progress of welding and plans the next day's work.



Regular preventive maintenance is essential to good radio operation. Equipment in the weatherproof housing behind cab of mechanic's truck is checked by John Metzger, superintendent of radio maintenance.

parts store in the nearest town may often have replacement orders within five minutes after a breakdown.

Radio control achieves better results during testing and pigging of the line. Quick valve closing orders preserve gas inventory, maintain line pressure, and reduce fire hazards.

All of the specific benefits of a mobile radio system on the contractor's spread may be summed up in one word—CONTROL. It gives the spread full flexibility, more economic operation and efficient—safe use of manpower and equipment.

Use this check list to keep spread radios at top performance

- **Maintain Power at Proper Levels.** Batteries seldom go dead without warning. A fully charged lead-acid battery under load may show a measured voltage of about 6.4 volts for "six-volt battery" and 12.8 volts for a "12-volt battery." An old sulfated or undercharged battery often shows voltages of 6 volts or lower. Terminal voltage at the radio units in the trunk of the car will probably be 0.5 to 0.7 volts lower than these readings when a load of 40 to 60 amperes transmit current is drawn.

  To check primary power trouble measure battery voltage both at the terminals of the battery and equipment. An immediate drop in voltage of more than 0.2 volt measured at the battery on a short transmit cycle would show that the battery is in poor condition. A drop of more than 0.7 volt would point to trouble in the primary circuit (cable, fuse block, relay, or chassis return) and should be fully inspected.

  Watch dry batteries, too. Check them under full load and keep track of the number of hours of use.

  Check AC sources of power. If primary voltages are either too high or too low a voltage regulator may be needed. Watch for loose connections or fuses and investigate all hot fuses or connectors.

- **Inspect Primary Circuit.** Replace worn out "A" relay contacts. Check fuses and replace if voltage drop exceeds 0.1 volt. Connections may become loose from vibration or strain. Tighten and resolder. Fuse holders may loosen with vibration, lose their temper because of heat resulting from poor contact. Acid causes corrosion and accumulations of oil and dirt increase contact resistance. The solution—**clean, tighten, or replace.**

- **Carry Out Regular Preventive Maintenance on Unit Assemblages.** Check performance frequently; make adjustments only when actual tests and measurements show poor operation. When making adjustments use meter and signals to indicate actual conditions. Check the system completely at least every three months and keep individual records of each unit.

- **Try These Four Tests.**

  LISTEN. An experienced technician can often detect warning signs of impending trouble by observing audio quality, noise background, squelch operation, and normal signal level. Degradation of performance will be more readily apparent to the technician than to the steady operator.

  Make frequent visual inspections of antenna, line and tower lights, mobile antenna mount, cables, and connectors frequently. Meter checks will locate open or shorted lines or high standing wave ratios.

  LOOK. Check for loose bolts, screws and clamps, worn microphone cords, burned out pilot lights, arcing at any point, loose or broken components, burned resistors, or loose connections. Visual inspection not only locates many troubles quickly but may prevent more serious trouble from developing later.

  FEEL. Fingers are good detectors of temperature conditions. Hot fuses, fuse holders, crystal ovens, transformers, and relay coils mean trouble. A cold crystal oven, tube or resistor that should normally be warm can also be spotted quickly.

  MEASURE. Take meter readings of "A" and "B" voltages, grid and plate currents, power output, frequency, and deviation. Their meaning is definite—experience will tell what tolerances may be allowed.

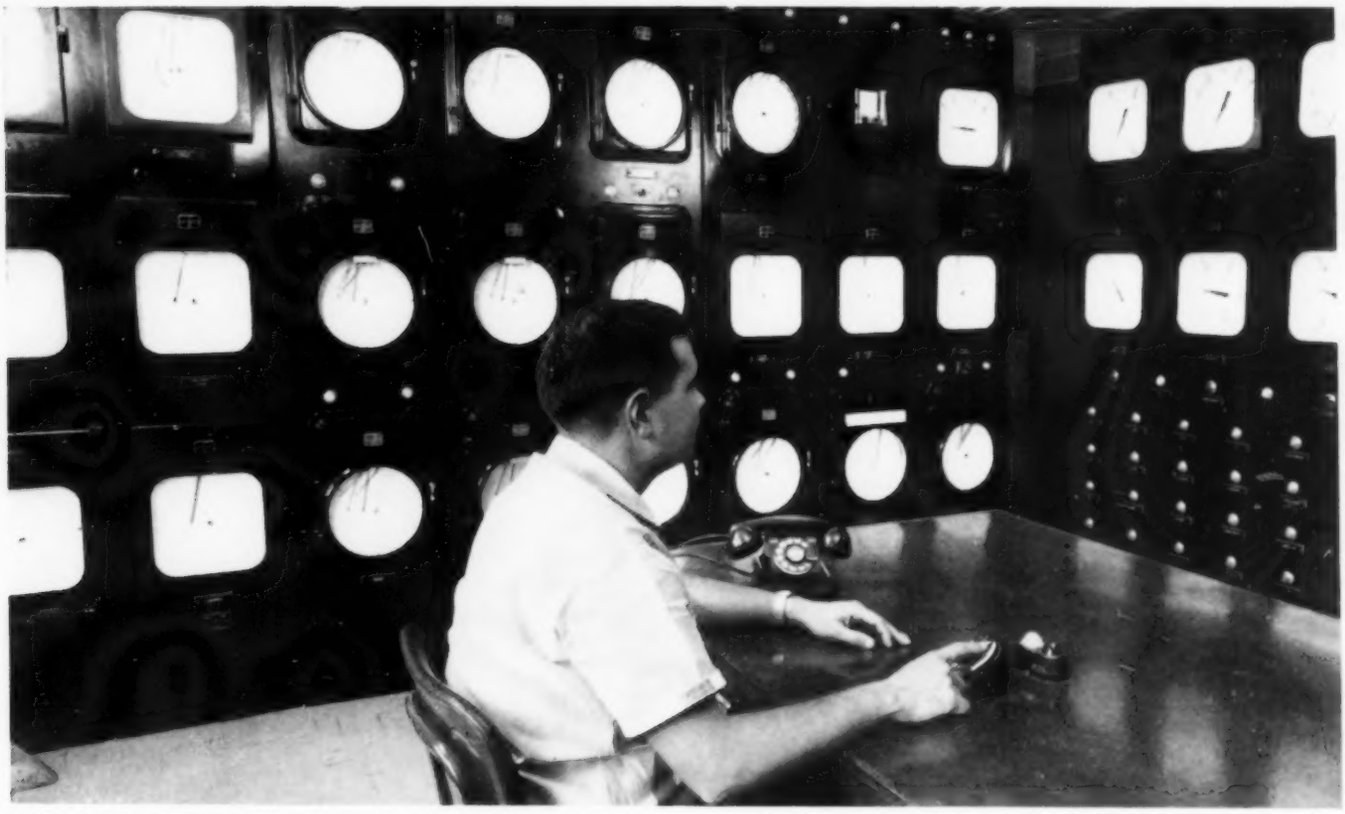
  Good test equipment is essential to top system performance—it is not an expense but a worthwhile investment.

- **Watch Operating Safety Factors.** Some radio systems have been operating with no safety factor whatever. The slightest drop-off results in a trouble call. Such systems cannot be maintained at reasonable costs. Others with adequate safety factors operate for long periods before trouble calls are reported.

- **Proper Netting Is a Must.** All receivers and transmitters in a given system should be aligned on the same frequency. Careful "netting" of all units in an integrated system to the correct frequency will eliminate a prime cause of poor system performance.

- **Make Frequent Checks of Transmitter Deviation.** Frequency and deviation checks are more important than the twice yearly FCC regulations might indicate. Be sure that transmitters are swinging a normal ± 15 kc. for standard channel and ± 5 kc. for split channel operation.

- **Believe the Operator.** If he says equipment is faulty, the system is probably not working properly even though his description of the trouble may not be accurate.



Bell System *selective calling* is used by the dispatcher of Mississippi Valley Gas Co. By flipping a switch, dialing the number of a distant metering point and reading a meter, he knows the pressure, flow and temperature at any of the company's 21 field points.

"When you're sure how much you have, you know how much you can sell"

J. H. Lambdin, Vice President—Operations, Mississippi Valley Gas Company

Bell System telemetering channels provide data on which Mississippi Valley Gas Co. can regulate flow to within 1% of a 60,000 MCF supplier contract limit. With this up-to-the-minute picture of the system, the company is better able to sell more gas.

This system, first of its kind in the country, was designed especially for Mississippi Valley. Used only to read remote meters now, it can be adapted to perform actual control functions at distant points.

• • •

If you'd like to have faster, more efficient communications, call your Bell Telephone representative. He will be glad to study your needs.

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Wanted: More and Better Engineers

Leadership in solving the engineer shortage problem is up to the engineers themselves.

By JOHN M. CAMPBELL
University of Oklahoma,
Norman, Okla.

Are we losing the technological race with Russia?

There are strong supporters on both sides of this all-important question. If we *are* losing out, it is because we are falling behind in technical manpower.

The U. S. needs more and better engineers. Reasons behind our need are two-fold:

1. We are lagging behind in our efforts to attract students into engineering.

2. We are not giving engineering students the superior education they need.

The first problem has some discouraging aspects. Recent surveys show that only a small percentage of top high school graduates want to be engineers. Some students interviewed said that engineering school was too hard for the ultimate benefits. Industry, therefore, must make the engineering profession more attractive from the standpoint of remuneration and promotion to top executive posts.

Engineers are professional men but they've done a very poor job of selling the idea to the public as compared with doctors and lawyers.

They can increase their stature only through a vigorous "selling campaign" and setting certain standards before a man may practice as an engineer. This can be accomplished by:

1. Companies using the job title "engineer" only in those instances where that job requires a man with at least a B.S. degree in engineering.

2. Requiring by law that any person advertising or offering himself for hire as a consulting engineer be a registered professional engineer in his state.

3. Effectively preparing material that emphasizes the importance of engineers, and the attendant social and economic advantages —all geared to appeal to the psychology of the high school age student.

This appeal factor might appear at first to be a rather nebulous one, but it is significant that our international competitors are using it rather effectively.

The matter of better education is also an integral part of the problem for, as our technology advances, the demands on education become more severe.

One needs only to look at university records to become convinced that too many freshmen enter college inadequately prepared. This situation stems from the fact that some schools, because of size and/or finance, do not offer adequate science programs, or because students do not take them when offered. When students leave a high school ill prepared for college, it is not the fault of the principal or superintendent, it is squarely the fault of the local people for whom they work. It is a matter of record that a school is only as good as the constituents want it to be.

1. Better technical education in the secondary schools.

2. Improvement and strengthening of college curricula to meet our changing needs.

3. Providing and maintaining superior teaching staffs.

4. Providing proper and sufficient physical facilities for education.

It is even more perplexing when pre-engineering students do not take the courses when they are offered. Courses in driving, dancing, etc. are certainly important but are hardly a good foundation for the would-be engineer when substituted for mathematics, chemistry and physics. To solve this problem, professional groups such as the API and AIME should take the lead in providing:

- Advice to parents so that they might be aware of the educational needs of their sons.

- Consultation with high school students about the requirements (and advantages) of being an engineer.

- The leadership necessary to see that local schools are adequately staffed and financed.

The curriculum problem is the responsibility of the universities but professional societies can be extremely helpful in keeping the administrative officials aware of the needs.

The teaching staff problem is inevitably tied up with money. The serious shortage and subsequent demand for experienced engineers has left universities in a poor competitive position. Consequently engineering staffs are composed of men who do outside consulting to bring their income up to standards, or those who are willing to teach for less money. There are just too few of the latter.

It seems unlikely that the necessary funds will be forthcoming from state funds. A large number of voters in any state are not overly education-conscious and are more anxious to get a road by their home than support the university. It is therefore logical that their legislators vote accordingly. It is further felt that the proposal of more taxes for educa-

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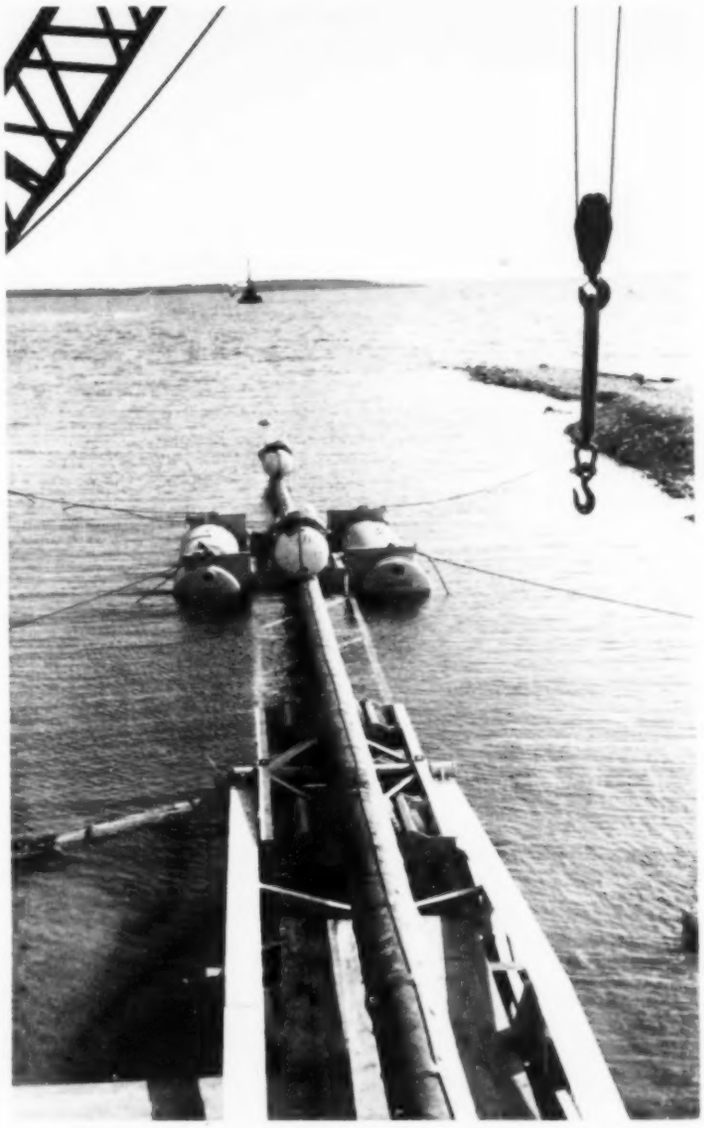

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tional purposes would be political suicide. In view of this it would appear that industry must help out since the success of the school reduces the cost of obtaining a finished engineer.

Although an occasional large gift from a foundation is laudable, it hardly makes a serious dent in the problem. Direct subsidization in the form of a simple gift except as an occasional award for outstanding work is not recommended for it carries the impression of charity; the giver often regards it as just a necessary evil and the recipient performs no particular tangible service for the money. Instead one or more of the following proposals should be considered:

1. Industry refer some of their engineering and fundamental research problems to the universities. This would make income available and would show a return to the company. Many fundamental problems could be solved through university facilities at less cost than in high overhead company facilities. More fundamental advances are possible because many company labs have to concern themselves with immediate operating or applied problems.

2. Provide bigger fellowships so that more scholars can afford to pass up lucrative starting offers and obtain Ph.D. degrees. Most fellowships now pay $100-$150 per month which is not sufficient unless the student has outside income. Since many of the students are married at that point the wife must work, unless there are children. It is a matter of record that there are not enough Ph.D. petroleum engineers to staff the schools let alone meet industry requirements.

3. Work out a program of lending a scientist to a university for a period of one year. If all companies cooperated there would be no noticeable drain on manpower and it would be good training for the man, help alleviate a staff problem, and give the students the benefit of the man's experience.

4. Have qualified professors conduct advanced and/or refresher engineering courses in district, division, area or main offices. This would free regular personnel for full time company activities and enable the use of professional teachers.

5. Institute cooperative engineering projects between the company and individual outstanding professors. Both parties would benefit from such an association.

Most companies have been very generous in the loan or gifts of equipment. This is sincerely appreciated and helps tremendously. If sufficient space is provided this problem appears to be easily solved.

If these things were done it would then be up to the universities to produce the type of men needed. It is through these channels that we have the best possibilities of removing the "Engineering Help Needed" signs and meet our educational challenges.

One stop gap measure involves the better utilization of trained engineers. It is appalling sometimes to see the semi-technical and clerk type chores often relegated to trained men. This is a natural evil for such men usually do the job well with a minimum of supervision. Consequently it is an evil that must be religiously guarded against for we are all prone to be subject to it.

The training of technicians to do these tasks is another of our problems but beyond the scope of this discussion. As our industry becomes more complex, however, some provision is necessary for this type of training.

In conclusion, it is evident that the leadership in solving these problems must come from engineers themselves, acting both individually and through their societies and companies.

—The End

If the U. S. is to win the technological *race* with Russia—everyone has to help increase our technological *force*:

The Oil Industry can help by:

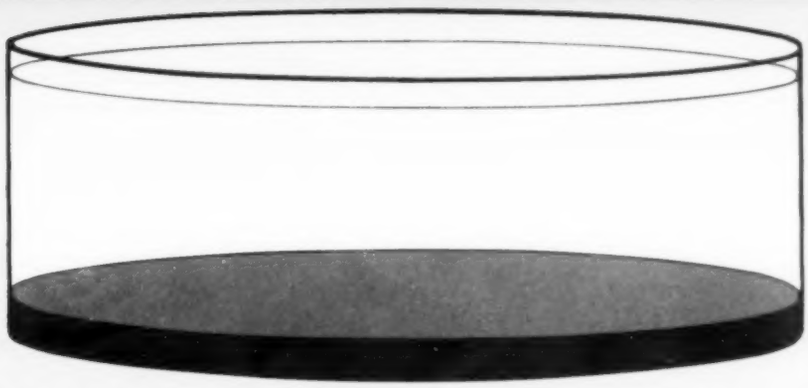
1. Referring some of its engineering and fundamental research problems to the universities. This would make income available and would show a return to the company.
2. Providing bigger fellowships so that more scholars can afford to pass up lucrative starting offers to obtain Ph.D. degrees.
3. Working out a program of lending a scientist to a college or university for a period of one year.
4. Having qualified professors conduct advanced and/or refresher engineering courses in district, division, area or main offices.
5. Instituting cooperative engineering projects with companies and outstanding professors.

Oil Companies can help by increasing the prestige of the engineering profession. This can be done if each company will:

1. Use the job title "engineer" only in those instances where the job requires a man with at least a Bachelors degree.
2. Require by law that any person advertising or offering himself for hire as a consulting engineer be a Registered Professional Engineer in the State.
3. Effectively prepare material that emphasizes the importance of engineers and the attendant social and economic advantages—all geared to appeal to the psychology of the high school student.
4. Give the higher calibre students an incentive to enter the engineering profession by offering more attractive promotion plans and higher salaries.

The Public, with the aid of industry, can help by:

1. Demanding and supporting better technical education in the secondary schools.
2. Helping to improve and strengthen college curricula to meet our changing needs.
3. Supporting all financial efforts to provide and maintain superior teaching staffs.
4. Supporting all financial efforts to provide proper and sufficient physical facilities for education.



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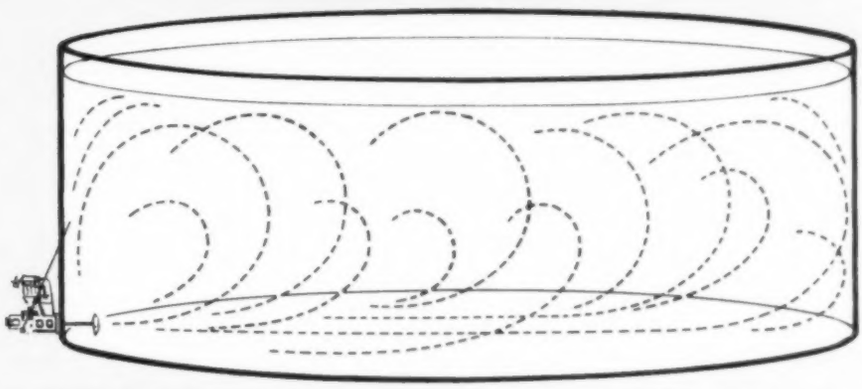

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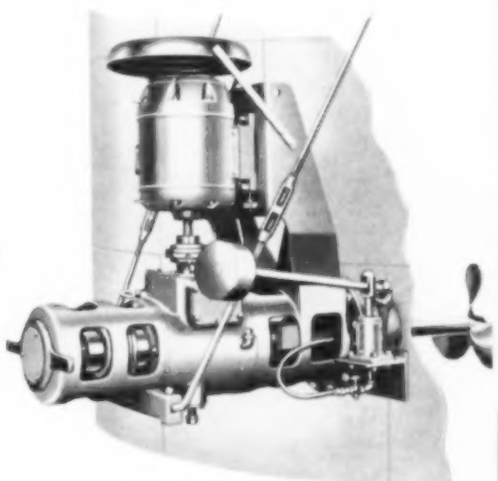

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How to Get Top Results From Your Interviews

The formula for successful interviews is outlined in these simple, easy-to-follow rules.

By HAROLD A. EDGERTON
Richardson, Bellows, Henry & Company
New York City

THE TWO MOST common faults in interviewing are:

- Lack of a specific plan for conducting the interview.
- Failure to let the interviewee do most of the talking.

These flaws in interviewing techniques can be easily eliminated through self appraisal. Check your own interviewing methods against the following suggestions for an ideal interviewing plan. You will find they are designed to help you improve interviewing skills.

Establish Your Objectives—The first step in improving skills is to define just what you want the interview to tell you. Such definitions are best expressed in terms of questions. For example: "Has this man had experience which should make him a good pipe line engineer?

You need to know, of course, what kinds of experience are pertinent to the question, and just which experiences indicate a good pipe line engineer and which would suggest mediocrity. "Is there anything in his background which would indicate that he would have trouble getting along with other pipe line men." Friction with associates, attitudes of looking down his nose or belittling associates, being the big "I am," being strongly opinionated, and the like, may be indicated for this question.

Does he have characteristics which might make him an undesirable employe? What are his motivations? Why does he want the job? What are his ambitions? Why did he leave former jobs, etc. All these may bring out some useful evidence on motivation.

The second step is to list—write them down on paper—a number of topics for discussion to bring forth information which will shed some light on the questions you want to answer. These will, of course, be related to your purpose. Some of these questions might be: How did you like the people in that organization? Who was your boss on the last job? How well did he know his stuff? What kind of a situation do you expect/hope to have ten years from now? Just what did you do on that job? Any headaches in supervising a group like that?, and so forth.

Next you will need to know something of the man you are going to interview. Why is he coming to the interview? How is he likely to react to the interview? Does he have a particular point of view which you should consider?

Interviews should be held on schedule, with a minimum of inconvenience. The place of the interview should provide sufficient privacy for the purpose and topics of the interview. The more personal the interview the more privacy needed. Privacy may be either auditory or visual, usually both. Privacy also includes freedom from interruptions, and from distracting noises and events.

Above all, be ready to listen. Listen to what the interviewee has to say in response to your questions. Listen to how he says what he has to say as well as to what he says.

Most situations permit you to take notes. Do that inconspicuously but not secretively.

Conducting the Interview—Gain and deserve the confidence of the man you are interviewing. Keep his confidence throughout the interview. Your interviewee can "give" more and better when he is at ease and when he knows the purpose of the interview.

First of all put your man at ease. Greet him like you are glad to see him. See that he is physically comfortable, a good chair, not facing the light, etc. Start the conversation yourself, talking briefly about things unrelated to the interview but of interest to your man. Give both of you a chance to relax and feel at ease with each other. Then you are ready to go ahead with your interview.

Begin with an explanation of the purpose of the interview. Indicate how he relates to the purpose, why he should be interviewed, and in general, what you expect to learn from the interview. Start with questions which are general, questions which give the interviewee an opportunity to talk. Questions should be the kind which call for longer answers and cannot be answered by a few words or a yes or no. Such specific questions may come later. Frequently they will be answered before they are asked, if the man is given a chance to tell about himself in his own way.

As interviewer, you have two jobs: to be a good listener, and to provide the questions and comments which enable the interviewee to create the answers which you are seeking.

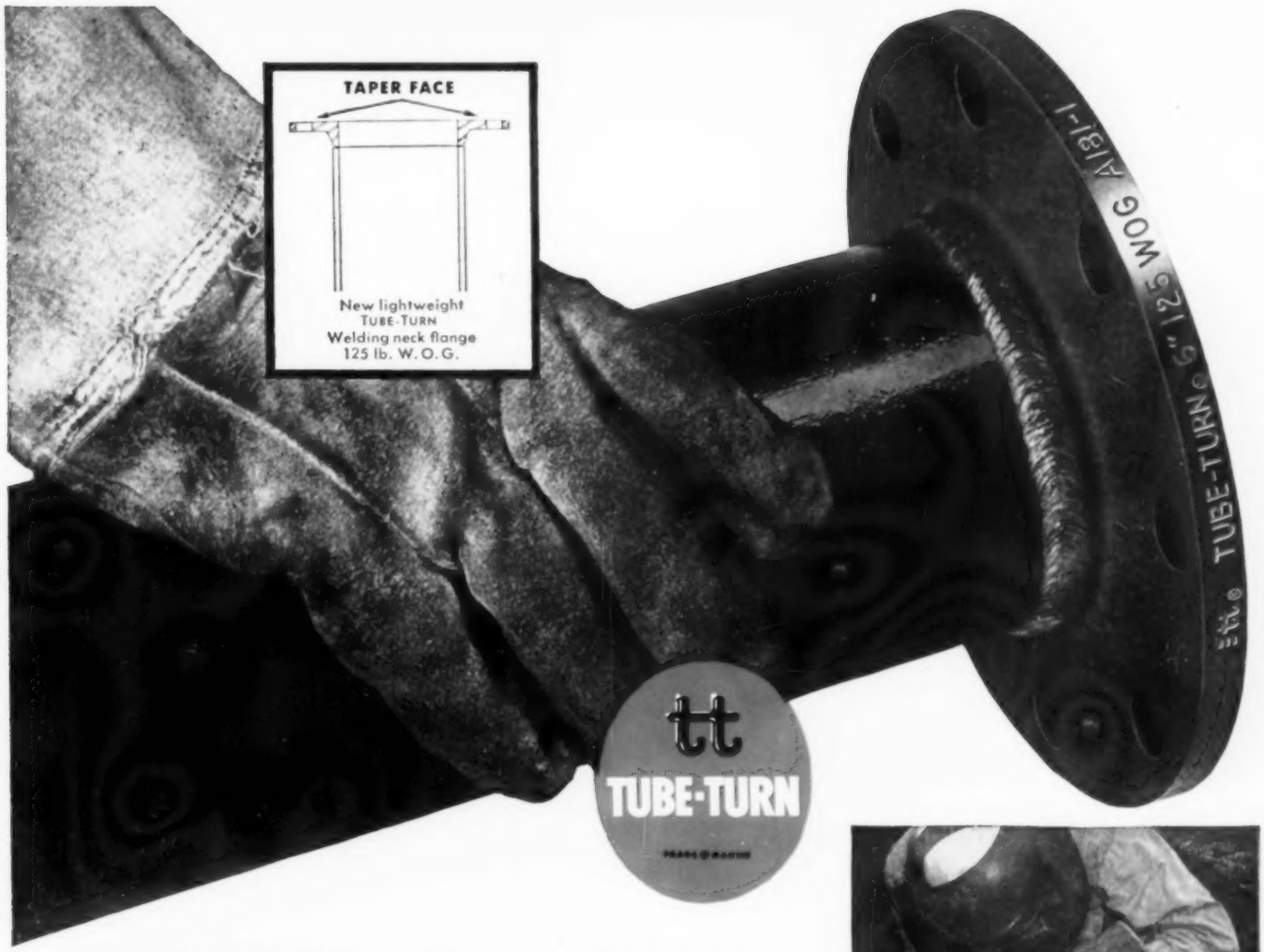
Once the interview is really "warmed up," probing questions may be used to clarify information, attitudes and feelings. Such questions should be asked as a means of getting better understanding, more detail, a clearer picture of attitudes and feelings, never as cross examination.

Your purpose is not that of provoking an argument, but that of understanding clearly the man who is being interviewed. Sincerity, patience and understanding are useful for this purpose.

Avoid putting your man on the spot or making him look stupid or foolish. This does not mean that you should not ask pointed questions, but rather that they avoid that personal "bite."

A straightforward and frank approach is more fruitful than one which looks shrewd or clever. The latter makes your man feel that he should be careful not to step into a trap.

Your questions should be aimed at the purpose of the interview but not



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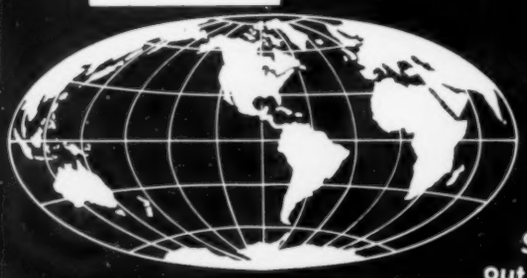

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be loaded or leading questions. If your questions imply answers, you have biased the interview and obtained, in part, support for your preconceived judgment of the individual or his situation.

Be sure you are understood. It is not at all satisfying to have an interviewee answering questions you did not think you asked and failing to answer those you believed you asked. Use language which will be understood by your interviewee. It is not necessary to use his language, but use common clear words. Use simple rather than involved sentences, and in so doing ask only one question at a time. Interpret the answers you hear at once so as to be sure that you have obtained the information you seek and have it straight.

When and how to record interview data will be determined by the kind of record you need to keep. If you want exact quotes of words, phrases or sentences, or if you need to keep a considerable record of details, then make notes as you interview. If general impressions, without much detail, are required, records of the interview may be made immediately after the close of the interview. It is not necessary to apologize for making notes. The fact of the interview itself should imply that some sort of record should be retained.

Closing the Interview. Make the interviewee feel that he has given you information that you are seeking, and that he has cooperated freely in so doing. He should also feel that he has benefited from having talked with you.

Commitments should be made regarding time of further action, who will take such action, etc., if the purposes which the interview serves call for such further steps. Allow no implications of further action which are not really honest. Don't let it be implied that he is the top candidate if he is not. Frankness is called for, but not brutal frankness.

How to Improve Your Interviewing—The brief suggestions given should help improve your interviewing techniques. The two most common faults in interviewing are lack of a specific plan for conducting the interview, and in failing to let the interviewee do most of the talking.

Self-criticism of ones own performance, and if you can take it, criticism by others are effective tools. A recording of your interview played back to you later furnishes the opportunity for you to hear yourself as others hear you. It may be noted that this method of using recordings of one's own interview is one of the best devices for improving your skill in interviewing. As you listen to your recording you should ask yourself some questions about the performance.

Your questions should include the following:

1. What evidences were there of a specific plan in the interview?
2. In what ways did the interview wander off the subject and purposes?
3. Did the interviewee answer the questions you asked?
4. About what percent of the interview time was occupied by your own talking?
5. What questions did you fail to ask?
6. What different conclusions regarding the interviewee or interview results do you reach after hearing the interview as an observer rather than a participant? —**The End**

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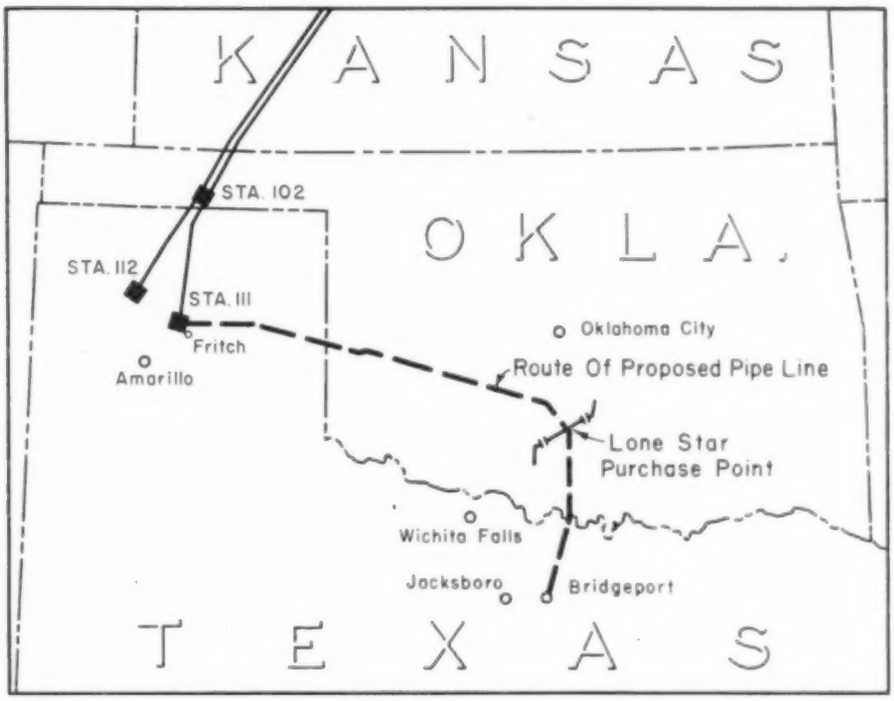


Route of Natural Gas Pipeline's proposed gas line.

Natural Gas Pipeline Wins Approval for 350-Mile Line

Natural Gas Pipeline Company of America has received approval for its 350-mile natural gas pipe line from Wise County, Texas, to a connection with its existing line at Fritch, Texas. Estimated cost is $28.5 million plus $3.6 million for production and gathering facilities.

At the same time the Federal Power Commission denied an application by Lone Star Gas Company to build a 230-mile line to Fritch, but gave Lone Star 30 days to negotiate a contract to sell gas to Natural at a point in Stevens County, Okla., where Natural's proposed line will intersect Lone Star's system.

Natural's line will have a capacity of 240 million cubic feet a day, and will tap reserves in northern Texas and Oklahoma for transportation to the Chicago area.

The FPC order granted certificates to a group of independent producers to sell natural gas to Natural from fields in Jack and Wise counties, Texas. Initial deliveries averaging 78 million cubic feet daily will be made to Natural from Sunray Mid-Continent Oil Company, Warren Petroleum Corporation and Oil Drilling, Inc., et al.

Certificates were granted to Natural and the independent producers by the FPC last February (See PIPE LINE INDUSTRY, March 1956, page 60) when the Lone Star competing application was denied. Proceedings were reopened several months later and Natural agreed to purchase gas from Lone Star at Fritch or in Stevens County. The Commission favored sale of gas by Lone Star to Natural in Stevens County and gave authorization to Lone Star subject to acceptance within 30 days. If Lone Star accepts the plan, Natural will build the necessary facilities to increase its present system sales capacity to receive Lone Star's gas.

2 More Contracts Let On Trans-Canada Line

Contracts for two more spreads on Trans-Canada Pipe Line's 34-inch gas line have been let and financing arrangements for the project are still underway.

Canadian Bechtel Ltd. has received the contract for its second spread on the line, extending 54 miles from Portage La Prairie to Winnipeg, eastern terminus of the 574-mile western segment of the line. Price-Poole Pipeline Constructors of Canada will start full scale construction of a 99-mile section as soon as weather permits in the early spring months of 1957. Brush crews of Price-Poole completed the clearing of right-of-way over this section of line in Manitoba Province, which extends eastward from the Assiniboine River near Miniota. Limited activity in the preparation for construction is expected to begin in January with the double jointing of pipe at Price-Poole headquarters in the town of Rivers in Manitoba Province.

A registration statement has been filed with the Securities and Exchange Commission in Washington covering a maximum of $120 million in Canadian funds. Financing will be in the form of units in the ratio of $100 principal of subordinated debentures due 1986 and $50 represented by five shares of common stock. The majority of units will be offered in Canada.

Proceeds of this financing will be used as part of a total of $375 million required to construct the 2287-mile transmission line.

Construction Started On Southern Pacific Line

Southern Pacific Pipeline Corporation has let contracts for construction of its 323-mile products line from the San Francisco Bay area to Reno and Fallon, Nev.

Estimated to cost about $16 million, the line is to follow the railroad right-of-way most of the length of the line. It connects refining areas along

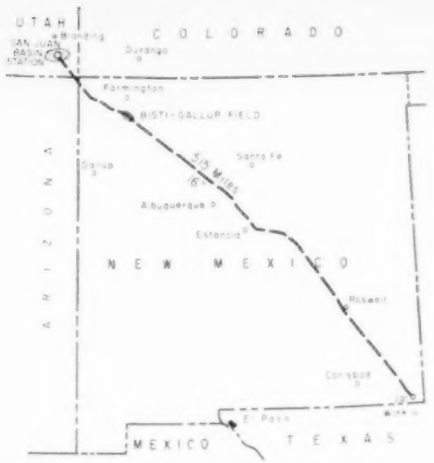
the route and carries refined products to markets.

Construction will be handled by Engineers Limited Pipe Line Company and J. E. Young Pipe Line Constructors, who in a joint venture will handle 184 miles in two spreads from Roseville, Calif., to Fallon Nev.; Hood Construction Company, 58 miles from near Lodi, Calif., to Roseville, Calif., and River Construction Corporation, 81 miles near San Francisco Bay to near Lodi.

Crude Line Underway In Southern Israel

Construction is reported underway on a new 8-inch crude line from Eilat, Israel's southernmost post, to Beersheba, approximately 150 miles. It is estimated to cost about $5.5 million.

From Beersheba the oil can be transported by rail to Haifa refineries, facilitating direct imports from the Persian Gulf without requiring passage through the Suez Canal.



Texas-New Mexico 50,000-bpd pipe line.

Texas-New Mexico Pipe Line To Build 515 Mile Extension

Texas-New Mexico Pipe Line Company has announced plans for construction of a 515-mile 16-inch pipe line extension from the company's Jal, N. Mex., pump station to the Four Corners area. Initial capacity of the main line will be 50,000 barrels per day and additional capacity can be obtained as needed by addition of booster stations.

Field survey work was to begin after January 1 and completion of the line will be contingent upon the date the necessary line pipe is secured and station pumping equipment is received.

Crude oil production is restricted at present due to lack of pipe line facilities from the area. The pipe line will pass through producing and prospective areas in New Mexico between the Four Corners area and Jal, where it will connect with pipe line facilities serving the Mid-Continent, Gulf Coast and Southwest areas.

Texas-New Mexico Pipe Line Company is owned by The Texas Company, Sinclair Pipe Line Company, Tidewater Oil Company and Empire Gas and Fuel Co. (Cities Service Company).

Kansas-Nebraska to Sell Gas to Northern Natural

Kansas-Nebraska Natural Gas Company and Northern Natural Gas Company have received approval from the Federal Power Commission to construct and operate natural gas facilities for the sale of gas from Camerick field in Texas County, Okla.

Kansas-Nebraska will build about

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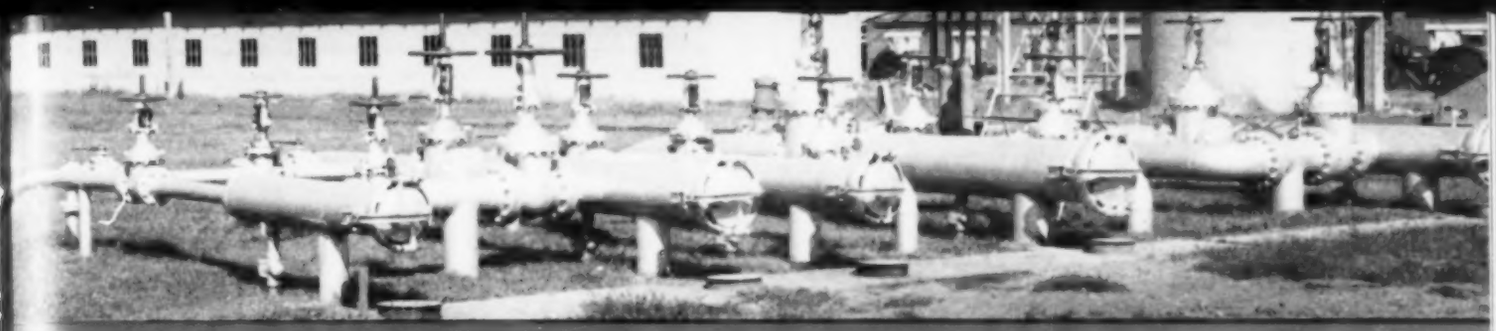

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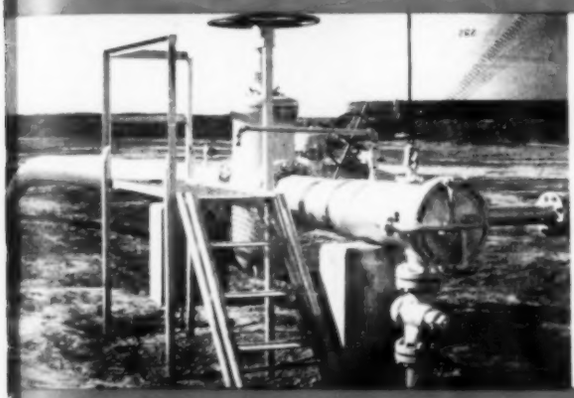

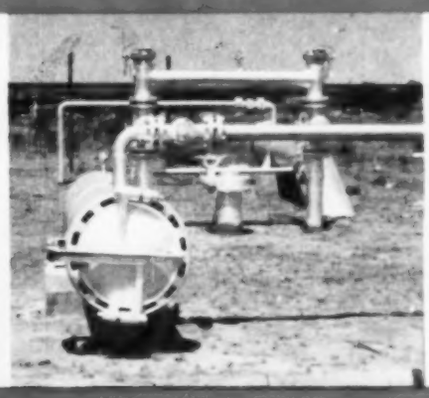

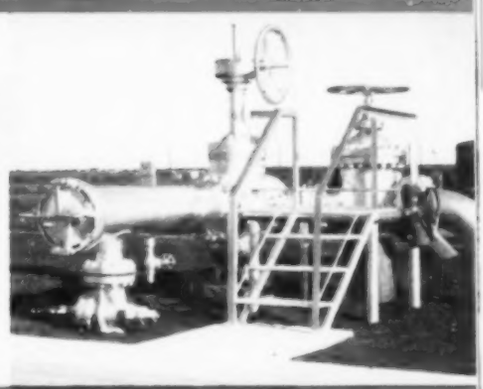

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All you need do to open the UNIBOLT Hinged Scraper Trap is release two bolts and the blanking plug swings open like a door. No heavy lifting. Nothing to fall on workmen. No time-consuming blind flanges to make up. No danger of leaks—the UNIBOLT self-sealing oil-resistant gasket, which seldom needs replacement, assures a pressure-tight seal and low maintenance.

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62 miles of gathering lines and measuring equipment from the Camerick field to Northern's Liberal, Kansas, station for the sale of gas by Kansas-Nebraska to Northern. The facilities will cost $1.4 million. Northern's adjustments to the station to receive additional gas are estimated to cost $3600.

Crude Line to Philadelphia Planned by Cape Pipe Line

A large diameter crude oil pipe line from Delaware Bay to greater Philadelphia area refineries will be built by a new corporation, Cape Pipe Line Company. Incorporators are Sun Pipe Line Company, Empire Gas and Fuel Co., a subsidiary of Cities Service Company, and Atlantic Pipe Line Company.

The proposed line is considered necessary because the supertankers now built require deeper channels than the present 40-foot depth which the Delaware River provides to Philadelphia. While the new pipe line will be a multi-million dollar project, it is said to be cheaper than dredging the Delaware to a depth to permit the 45,000 to 100,000 deadweight ton vessels to enter.

An unloading bulkhead will be built four to five miles offshore and submarine pipe lines will connect these facilities with extensive tank storage ashore where several million barrels of crude in various grades can be held prior to shipping inland. Daily capacity of the line is contemplated at more than half a million barrels.

Incorporators are extending an invitation to other companies in the area to participate in the line. The approximate completion date will be sometime in 1960.

Iroquois Gas to Acquire National Fuel Subsidiary

Iroquois Gas Corporation is seeking Federal Power Commission authorization to acquire the facilities of Republic Light, Heat and Power Company and to abandon the service it is presently rendering to Republic. Iroquois and Republic both are subsidiaries of National Fuel Gas Company.

Facilities Iroquois seeks to acquire are transmission properties in and near Buffalo, N. Y., in Chautauqua, Niagara, Genessee, Livingston, Ontario and Erie counties, New York.

Permian Plans Facilities In Midland County, Texas

Permian Basin Pipeline Company has requested authority to build 83 miles of 16-inch pipe line from existing facilities near its Spraberry compressor station, Midland County, Texas, to join the Pioneer Gathering System, Inc., in Schleicher County, Texas.

Permian has entered into contract with Pioneer for deliveries of gas up to 200 million cubic feet a day from Pioneer in Schleicher County. Initial deliveries, scheduled to begin in 1957, will be in excess of 60 million cubic feet per day. Permian's proposed additional facilities will cost an estimated $5 million. It will include construction of a 3960 horsepower compressor station in Schleicher County.

Application for the project has been made to the Federal Power Commission. The project will enable Permian to maintain sales to its parent company, Northern Natural Gas Company.

Offshore Products Line In Operation Off L. I.

The first offshore oil unloading installation on the Eastern Seaboard of the U. S. is now in operation on Long Island Sound, five miles northeast of Riverhead, L. I. Two pipe lines are in use and four more will be constructed to handle petroleum products consumed by Long Island home owners and industrial firms.

The Missouri Valley Dredging Company laid the pipe lines for the offshore operation which is owned and operated by the Northville Dock Corporation.

Tanker ships use the installation anchor 7200 feet offshore and discharge cargo into a rubber hose coupled to the pipe line on the bottom of the Sound and connected to storage tanks onshore.

Present storage capacity is 22.5 million gallons. To make the connection between pipe line and tanker, seven lengths of hose are coupled together and attached to the pipe line and tanker. This type installation eliminates need for piers and dredging of docks and channels and larger tankers do not have to transfer part of their cargo before mooring.

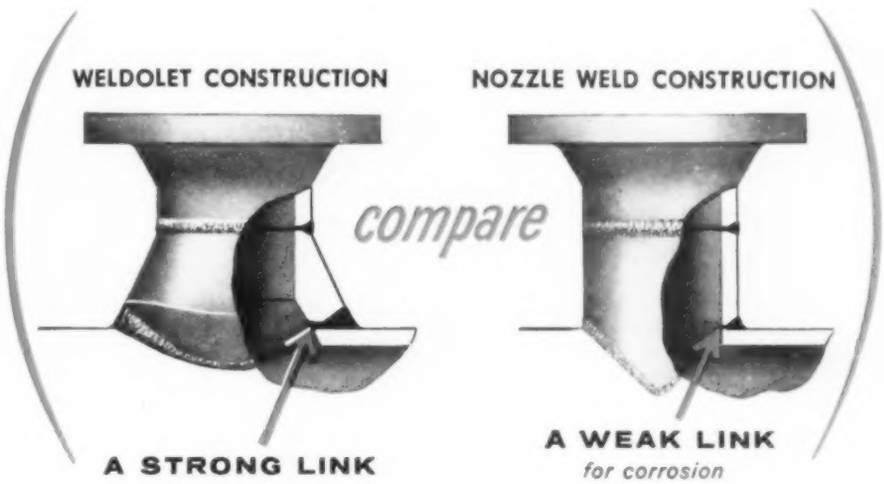
→ **years** to your piping

→ **gallons** to your flow

→ **strength** to an otherwise weak link

add → **BONNEY WELDOLETS**

to your piping drawings for all branch connections



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Construction to Begin On Humble's Crude Line

Construction is to begin early in 1957 on Humble Pipe Line Company's 94 mile 18-inch crude line from Ector to Kemper in West Texas. Lone Star Constructors will construct the line, which joins Humble's main line to the Gulf Coast.

This is part of a $3 million expansion program of Humble's Permian Basin crude pipe line system. Estimated capacity of the line will be 115,000 barrels daily. Plans include new pumping facilities at Ector.

Cities Service Gas Gets OK On Three Pipe Line Projects

Cities Service Gas Company has received Federal Power Commission authorization for three projects estimated to cost $5.5 million in Oklahoma, Missouri and Kansas.

One project includes the construction and operation of 35 miles of pipe line in Buchanan, Johnson and Lafayette counties, Mo.; Platte, Leavenworth and Lincoln counties, Kansas; the installation of 6750 compressor horsepower in stations at Leavenworth and Anderson counties, Kansas, Cass County, Mo., and Oklahoma County, Okla.; and the drilling and connecting of 55 injection and withdrawal gas wells. Estimated cost is $2.8 million. The FPC gave temporary authorization for construction last June but the approval did not permit operation of the facilities.

The second project, estimated to cost $1.4 million, is for construction and operation in Oklahoma of 29 miles of 20- and 30-inch pipe and addition of turbocharging equipment to two 1100 horsepower compressor units at the Edmond station, adding 250 horsepower to each unit.

Temporary approval has been granted to Cities Service for a $1.3 million 60-mile natural gas line in the Eureka area in Grant and Alfalfa counties, Okla. The line includes 37 miles of 4-inch, 8 miles of 6-inch, 8 miles of 10-inch, 4 miles of 8-inch and 3 miles of 12-inch line. These facilities will enable Cities Service to bring gas into its system from Grant and Alfalfa counties.

El Paso Natural to Acquire Facilities in Upton County

El Paso Natural Gas Company has been authorized to acquire and operate facilities from Lone Star Producing Company and to build 38 miles of pipe line in Upton County, Texas.

El Paso proposes to acquire the McElroy-Wilshire gasoline plant and related compression and gathering facilities from Lone Star Producing Company. To make available for processing additional volumes of gas, El Paso will construct 38 miles of various diameter pipe lines, add 2640 horsepower to that to be acquired from Lone Star, and make additions to the gasoline plant to enable it to process high liquid content gas.

Cost of facilities is estimated at $1.2 million for the gasoline plant and about $1.4 million for the proposed facilities. El Paso and Hunt Oil Company would each pay one half of the cost of acquisition and construction.

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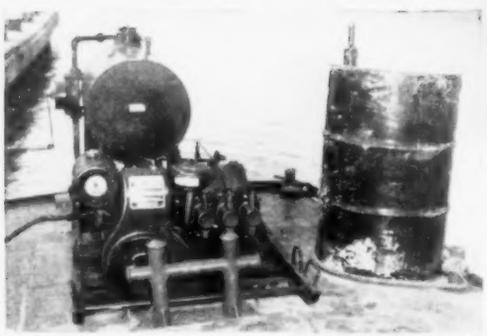
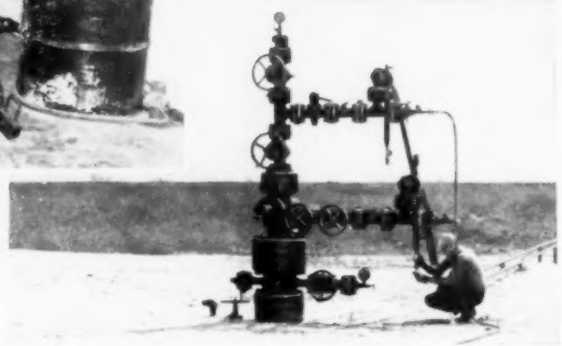
Injection Pumping Unit for Anti-Corrosion Tubing Treatment





This interesting injection unit, shown here "on location" near Grand Chenier, La., is mounted on the stern of a boat for convenient servicing of 32 oil wells along the waterway . . . designed to prevent or minimize corrosion to casing and tubing where surface pipe is immersed in salt water.

Chemicals are forced into the tubing under high pressure which must exceed the well pressure. The "Christmas Tree" assembly shown above is receiving the full treatment under 6100 lbs. pressure, which is supplied by a Model AEN Wisconsin Single Cylinder Heavy-Duty Air-Cooled Engine.

This Wisconsin-powered pump and chemical storage unit, built by McFarland Engineering & Pump Co., Houston, Texas, again demonstrates the unlimited versatility and rugged dependability of Wisconsin Engines in oil field service. Wherever the job calls for High Torque Performance and practically foolproof maintenance, Wisconsin Heavy-Duty Air-Cooled Engines carry the load on every type of power assignment that can be handled in a 3 to 36 hp. range.

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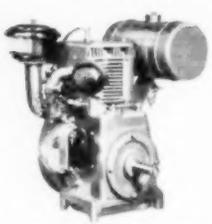

Model AEN 4-cycle single cylinder Wisconsin Heavy-Duty Air-Cooled Engine. 4.5 to 8.25 hp., 1600-2200 rpm.

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Crouse-Hinds — and only Crouse-Hinds — can provide positive protection *wherever* the merest spark can possibly occur in explosive atmospheres . . . from size 5 motor starters to sound-powered telephones. There are over 15,000 conventional and explosion-proof products in the Condulet line! They are available through your Crouse-Hinds distributor.

For further assistance on your explosion-proofing problem, just call the nearest Crouse-Hinds office listed below. Our field engineers are *electrical* engineers, fully qualified to make specific recommendations for your plant.

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Proposed Pipe Line Construction

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Alberta Gas Trunk Line, Ltd.	547	6-34	Gas	From Alberta fields to western terminus of Trans Canada Pipe Line, Ltd.	$47 million	Approved
American-Louisiana Pipe Line Co., Detroit		12-16	Gas	From No. Holly Beach field and Second Bayou field, Cameron Parish, La.		Before FPC
Andes Pipeline Corp.	500	12	Gas	From Villamontes, Bolivia to Antofagasta, Chile.	$30 million	Planned
Bolivian Gulf Oil Co.	201	8-10	Crude	Sicasica, Bolivia to Arica, Chile	$10.5 million	Planned
British Petroleum Company		16	Crude	Popton Point, South Wales, to Llandarcy refinery	$14 million	Considered
Cities Service Gas Co.	35	6, 12, 16	Gas	Facilities in Kansas, Missouri, and Oklahoma	$2.8 million	Authorized
	28	20-30	Gas	Facilities in Oklahoma	$1.4 million	Authorized
	60	4-12	Gas	In Grant and Alfalfa Counties, Okla.	$1.3 million	Authorized
Coastal Transmission Corp.—Houston, Texas	565	20-26	Gas	McAllen, Texas—Louisiana connection, Houston, Texas Gas, plus 272 miles of laterals	$68 million	Before FPC
Colorado Interstate Gas Co., Colorado Springs, Colo.	734	22-34	Gas	Texas & Oklahoma Panhandle to Kit Carson, Colo., to Beatrice, Neb.	$87 million	Before FPC
	36	26	Gas	East Denver to South Denver station and loop of Portland lateral	$1.3 million	Authorized
Compania Shell de Venezuela	177	20	Gas	La Paz field to Cardon refinery on Paraguana peninsula	$20 million	Planned
Consolidated Gathering Systems, Ltd.	198		Crude	Sturgeon Field—Edmonton		Planned
Creole Petroleum Corp.	94	28	Crude	Temblador to Caripito, Venezuela	$5.6 million	Planned
Deep Rock Gas Co.	120	6	LPG	Tioga, N.D.—Canadian border		Planned
El Paso Natural Gas Co.	888		Gas	Facilities in Texas, New Mexico, and Arizona to deliver gas near Blythe, Calif. and Topock, Ariz. to So. Counties Gas Co., So. Calif. Gas Co. and Pacific Gas & Electric Co.	$84.5 million	Authorized
	108		Gas & Products	Facilities in Andrews and Ector Counties, Texas	$5 million	Authorized
	28	10	Gas	Nolan and Coke Counties, Texas, plus compressor station facilities	$1 million	Authorized
El Paso Natural Gas Products Co.	240	8	Products	Midkiff natural gasoline plant in Permian Basin to El Paso		Planned
Great Lakes Pipe Line Co., Kansas City, Mo.	84	8	Gas	Extension of system to Eau Claire, Wisc., and loop with line into Chicago from system's junction with Badger system.		Planned
Houston Texas Gas & Oil Co.—4604 Main St., Houston	961	12-30	Gas	Baton Rouge, La. to Miami, Fla. plus 496 miles of laterals and compressor facilities	$105 million	Before FPC
International Petroleum Co.	180		Crude	Pasto, Colombia, to Pacific port of Tumaco		Considered
Interprovincial Pipe Line Co.	150	20	Crude	Sarnia, Ont. to Toronto, Ont.		Planned
Interstate Oil Pipe Line Co.	55	8	Crude	Billings, Mont. to Wolf Springs, Mont.		Considered
Iraq Government	150		Gas	Kirkuk field to Baghdad		Considered
Iraq Petroleum Co.	1,200	38-40	Crude	Kuwait to Iskenderun, Turkey		Considered
Iron Ranges Natural Gas Co.	115		Gas	From Itasca and St. Louis Counties along route of Mesabi range from Grand Rapids to Aurora, Minn.	$5 million	Before FPC
Iroquois Gas Corp.—Buffalo, N.Y.	36		Gas	Facilities in Chautauqua, Cattaraugus and Erie counties, N.Y. to develop new underground storage area.	$2.5 million	Authorized
Israel Government	70	6	Products	Haifa to Tel Aviv	$1 million	Planned
Kansas-Nebraska Natural Gas Co.	62		Gas	Gathering line and measuring facilities from Camerich field, Okla. to Northern Natural Gas Co.'s Liberal, Kansas, station.	$1.4 million	Authorized
Lone Star Gas Co. Dallas	230	22-26	Gas	Cotton County, Okla. to Fritch, Texas	$18.7 million	Before FPC
Magna Pipeline Company	40		Gas	Underwater line from Anacortes, Wash. to Victoria, B.C.	$6 million	Planned
Mene Grande Oil Co.	62	30	Crude	Anaco to Puerto La Cruz, Venezuela	$5.8 million	Considered
Michigan-Wisconsin Pipe Line Co.—500 Griswold, Detroit	472	4-24	Gas	Main line loops and extensions in Wisconsin, Illinois	$17.6 million	Before FPC
	252		Gas	Loops in Missouri, Iowa, Wisconsin and Illinois.		Contracts let
Midwestern Gas Transmission Co., Houston, Texas	1112		Gas	Emerson, Manitoba—Nashville, Tenn.	$98 million	Before FPC
Mountain Fuel Supply Company	38	20	Gas	Parallel line and facilities to transport gas from Pacific Northwest line in Sweetwater County, Wyo.	$3 million	Authorized
NATO	1920	4-10	Products	To serve military bases in Western Europe		Some contracts let
Natural Gas Pipe Line Co. of America—20 N. Wacker Dr., Chicago	350	20, 26	Gas	Wise County, Texas—Fritch, Texas	$28.5 million	Authorized
	25		Gas	Quinduno field in Roberts County, Texas	$3.2 million	Authorized
	416	36	Gas	Loops at various points along existing line	$76.2 million	Before FPC
New York State Natural Gas Corp.	27		Gas	Elk County, Penn. to Luthersburg gas field in Clearfield, Jefferson and Indiana Counties, Penn.	$1.5 million	Authorized
North Carolina Natural Gas Corp.	575	3-16	Gas	Mooresville eastwardly across North Carolina	$13 million	Authorized
Northern Natural Gas Co.—2223 Dodge St., Omaha	167	24	Gas	Farmington, Minn. to Duluth, Minn. and Superior, Wis.	$12 million	Before FPC
	42	10	Gas	Rochester, Minn. to Winona and Goodview, Minn.	$963,000	Before FPC
North-West Pipelines Co.	200		Crude	Wilhelmshaven on North Sea to Ruhr area of Germany	$46 million	Approved
Northwest Pipeline Corp.	350	6-10	Crude & Products	Four Corners area to Salt Lake City, Utah	$15 million	Planned
Offshore Gathering Corp., Houston	364	24, 26, 30	Gas, Crude	Texas side of Sabine River 25 miles offshore La. to Mississippi side of Pearl River	$150 million	Planned
Ohio Fuel Gas Co., Columbus	19	6-16	Gas	Loops on existing line to serve Dayton and Toledo areas and extension to McCutchenville, Ohio	$772,360	Authorized
Ohio Oil Company, Findlay, O.			Products	Wood River, Ill. to Chicago		Planned
Oklahoma Natural Gas Co., Tulsa	16	8	Gas	Connect gas supplies in Goteho field, Okla., to Clinton System in Western Okla.	$350,000	Planned
Pacific Gas & Electric Co.	150	34	Gas	Various loops, between Topock, Ariz.—Milpitas, Calif.	$20 million	85 miles let
	200	12	Gas	Northern California gas fields to Humboldt County, California	$9.5 million	Planned
Pacific Northwest Pipe Line Corp.—Salt Lake City, Utah	50	4-6	Gas	To serve industrial customers at Uravan and Nucla, Colo.	$1 million	Authorized
Pembina Pipe Line, Ltd.	100		Crude	Gathering line and new pumping unit in West-Central Alberta	$4.5 million	Planned
Pennsylvania Gas Co.	38	8, 10	Gas	In Erie and Warren Counties, Penn., and Chautauqua County, N.Y.	$930,000	Before FPC
Permian Basin Pipeline Co., Omaha, Neb.	83	16	Gas	Facilities near Spraberry compressor station, Midland County, Texas, to tie in with Pioneer Gathering System, Schleicher County, Texas.	$5 million	Before FPC
Petroargentina	370	16	Crude	Newguen—Bahia Blanca, Argentina	$40 million	Planned
Petroleos Mexicanos—Ave. Juarez, 94, Mexico City	440	20	Gas	Brazil—Tampico—Poza Rica, Mexico		Planned
	145	12	Crude	18 de Marzo Field—Monterrey, Mexico		Considered
	80	8	Products	Guaymas—Los Mochis	$1 million	Planned
Piedmont Gas Co.—Hickory, N.C.	78	2-8	Gas	From connection with Transcontinental Gas Pipe Line to serve customers in North Carolina	$2.6 million	Before FPC
Saskatchewan Power Corp.	80		Gas	Hatton gas field to Success, Sask.		Planned
	40		Gas	Moose Jaw, Sask. to Regina, Sask.		Planned
Scranton-Spring Brook Water Service Co.	37	12	Gas	Hebron-Greenwich facilities of Tennessee to Scranton and Wilkes-Barre, Pa.	$1.6 million	Before FPC
Service Pipe Line Corp., Continental Pipe Line Co., Sinclair Pipe Line Co. and Phillips Petroleum Co.			Products	Salt Lake City to Spokane, Wash.		Considered
Shell Oil Company and Standard Oil Co. of California	600	14	Crude	Four Corners area to Los Angeles area		Considered
South Alberta Pipe Line, Ltd.	46	10	Gas	Etzikom Field—Medicine Hat, Alberta	$1 million	Planned
South Saskatchewan Pipe Line Company	58	12	Crude	Cantuar field to Dollard field, Saskatchewan	$3 million	Contract let
Southern Natural Gas Company	52		Gas	Various locations in Ga.and La.	$2.2 million	Authorized
	28	8-12	Gas	Connect 3 gas fields to east leg of south La. supply system plus compressor station additions.	$2.9 million	Cotnracts let
Southern Pacific Pipe Lines, Inc.	300		Products	From San Francisco Bay area to Reno—Fallon, Nev.	$16 million	Contracts let
Stanmount Pipe Line Co.	140	10	Crude	Cayiga and Beaver Lake Fields, N.D. to connect with Interprovincial Pipe Line		Planned
Sturgeon Pipe Line Ltd.	100	12		Sturgeon Lake Field—Trans-Mountain system	$6.5 million	Planned
Tecumseh Pipeline Co.	190	20	Crude	To connect to principal crude line carriers in Chicago area for movement to east		Planned

SOFTENING UP

A ROUGH SPOT IN PIPELINING . . .

THE **NEW** CROSE PIPELINE **DITCH PADDER**

Forward Thinking Crose Engineering has produced *another* machine to reduce pipeline construction costs! This ditch padder has a screening head and conveyor that completely pads coated pipe with selected soft, rock-free soil. Sharp, pipe-damaging rocks are eliminated. No longer must padding material be hauled in from distant locations—now you can use all the good material from the spoil bank.

The Crose self-powered unit is quickly attached or detached from a standard pipeline side-boom tractor in a matter of minutes . . . releases tractor for other work along the line when not padding pipe.

This new Crose equipment will tremendously reduce your padding costs For further information, write or call Crose today.

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Proposed Pipe Line Construction—(Continued)

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Tennessee Gas Transmission Co.—Box 2511, Houston (See also Midwestern Gas Transmission Co.)	100	....	Gas	Gathering lines in Texas and Louisiana plus station additions	$18.6 million	Before FPC
	1085	12-30	Gas	Southeast La. to Portland, Tenn.; from Kinder, La., to offshore wells in Gulf of Mexico; from Coudersport, Penn., to Hamburg, N.Y., and loop lines in Ky., W. Va., Penn.; compressor stations in Miss., Tenn., N.Y., Penn.; and additions in Tenn., Ky., Ohio, and Penn.	$166 million	Before FPC
Texas Eastern Transmission Corp., Shreveport, La.	77	30	Gas	Loops at various points between Kosciusko, Miss. and Uniontown, Penn.	.....	Authorized
	147	.....	.....	Supply and delivery lines laterals	.....	Authorized
Texas Gas Transmission Corp.	40	6-30	Gas	Parallel lines and compressor additions on existing lines in Louisiana, Missouri, Mississippi, Illinois, Kentucky	$6 million	Authorized
	.....	.....	Gas	To deliver gas from four Louisiana gas fields to American Louisiana system.	$783,100	Authorized
	13	20	Gas	East Lake Palourde line, Assumption Parish, to Thibodeux area, Lafourche Parish, plus metering facilities	$1.5 million	Authorized
Texas Illinois Natural Gas Pipeline Co., Chicago	38	36	Gas	Loops facilities in Illinois	$6.4 million	Authorized
Texas-New Mexico Pipe Line Company, Houston	515	16	Crude	Extension from Jal, N. Mex., pump station to Four Corners	.....	Planned
Trans-Canada Pipe Line, Ltd.—Calgary, Alberta	2250	30, 36	Gas	Alberta—Eastern Canada	$378 million	Contracts let for 6 spreads
Trans Carolina Pipeline Co.	280	8-18	Gas	Transmission line and compressor facilities plus 567 miles of laterals in tidewater areas of North and South Carolina	$21.6 million	Before FPC
Transcontinental Gas Pipe Line Corp.—3100 Travis St., Houston	.....	.....	Gas	Connecting facilities with Texas Eastern Penn-Jersey in Pennsylvania and New Jersey	$131,628	Authorized
	24.2	.....	Gas	Gathering Lines from South Bayou Mallet, Maxie and Happytown Fields, La.	$754,000	Authorized
	12	.....	Gas	Live Oak gas field, Vermillion Parish, La. plus two meter stations	$707,000	Before FPC
Trans-Europe Pipe Line	500	30	Crude	Mediterranean to northern Europe	.....	Considered
Union Oil Co. of Calif.—Los Angeles, Calif.	225	12, 16	Crude & Products	San Joaquin Valley to Union Oil's Oleum refinery on San Francisco Bay.	.....	Planned
United Fuel Gas Co., Charleston, W.Va.	18	12	Gas	Coco compressor station in Kanawha County, W. Va., to Belle, W. Va.	$845,853	Authorized
United Natural Gas Co.	50	12	Gas	Elk County—Jefferson County, Pa.	.....	Planned
U. S. Navy	450	8	Gas	Gubik Field—Fairbanks, Alaska	$20 million	Planned
Washington Gas Light Co.—Washington, D.C.	28	20, 24	Gas	From metering station of Atlantic Seaboard Corp. to Washington to connect with line leading to District of Columbia facilities	$3.4 million	Authorized
Westcoast Transmission Company, Ltd., Calgary	270	8-26	Gas	Various locations in Peace River region	.....	Contracts let for 155 miles
Westspur Pipe Line Co.	20	12	Crude	Alida to Carnduff-Glen Ewen area of Saskatchewan plus 34 miles of gathering line	.....	Planned
Wilcox Trend Gathering System, Inc.	16	16	Gas	Gathering lines to Provident City, Texas	$2.9 million	Before FPC
			Gas	Mineral field, Bee County, Texas, to main line		Before FPC
Winnipeg and Central Gas Co.	450	4-8	LPG	Tioga, N.D.—Winnipeg, Canada	$20 million	Planned
Yacimientos Petroliferos Fiscales	808	.....	Gas	Campo Duran, to Buenas Aires, Argentina	$76 million	Planned
	621	.....	Crude	Mendoza to San Lorenzo, Argentina	$19 million	Planned
Yacimientos Petroliferos Fiscales Bolivia	86	.....	Crude	Yacuiba to Bermejo, Bolivia	$3 million	Considered

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HOLDS PARAFFIN IN SUSPENSION from FORMATION to REFINERY

Now is the time to give yourself a break with BrakeSol and clean the paraffin from your production system. Then keep it clean by setting up a program of constant treating.

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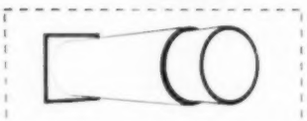

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Rockwell-Nordstrom valves are lubricant sealed for *positive, continuous* shut-off on heavy crudes or light gases.

Fast Operation?

Rockwell-Nordstrom valves close with just a quarter-turn. Pressurized lubricant makes operation smooth, easy . . . jacks the plug for *instant* operation.

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Rockwell-Nordstrom valves have *no bonnet or body cavities* to collect valve jamming sediment. Flow is clean as a whistle . . . minimum pressure drop.

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Rockwell-Nordstrom valves have *no exposed seats* to wear out . . . lubricant reduces wear for longer life at lower cost.

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Rockwell-Nordstrom valves are available in sizes to 30", API ratings to 10,000 lb. They can be ordered with wrench, gear or power operators to fit any need.

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Rockwell-Nordstrom valves cost no more to buy than ordinary valves. And they *stay* reliably on stream at *lower* cost than *any* other valve.

You get all the performance and economy you look for in pipeline valves when you specify "Rockwell-Nordstrom." Get the complete story from your nearby supplier, or write Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

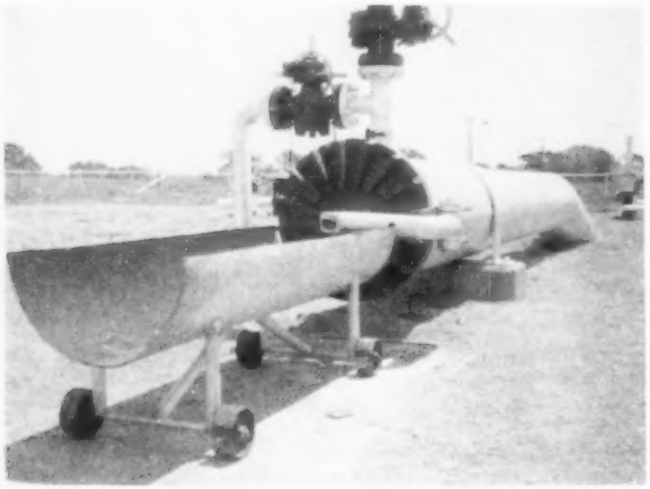
ROCKWELL-Nordstrom VALVES

Lubricant Sealed For Positive Shut-Off

How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas



Handy Cradle on Wheels Facilitates Pig Launching

This convenient 'cradle' is being used by one company to enable the 'sending' of a large diameter pig—using only two men for the launching operation. The cradle is made entirely from scrap metal, using 26-inch pipe for a bed, and supporting it on two-inch pipe legs with rollers.

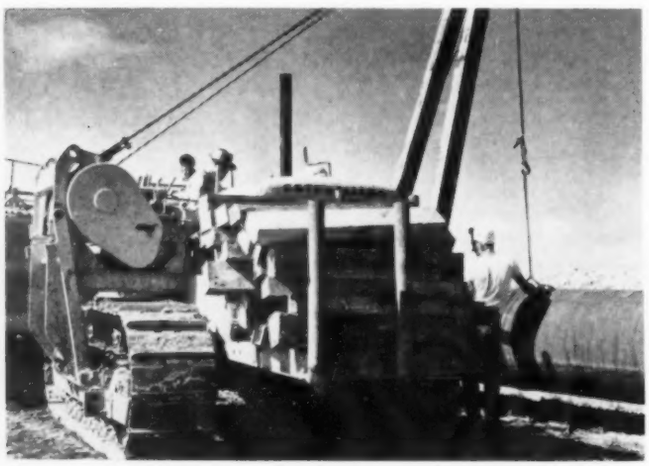
When ready for launching, the pig is about even with the open end of the trap and can be easily handled by two men. As soon as it has been received at the other end, the pig is loaded on a truck and returned to the cradle to await its next trip.

Keep Construction Tools Dry With Portable Warehouse

Keep your welding rods, felt and construction tools out of the rain by building this portable warehouse for use on the right-of-way. Sides and top are made up of a small diameter frame and sheet metal covering—the framework is all pipe.

When setting the shed up on muddy ground, the floor can be built up with timbers and covered with lumber. The entire unit is collapsible so it can be quickly knocked down and moved ahead as often as the job demands.

This rig can make convenient shade for welders prefabricating manifolds, scrapper traps, etc.



Carrying Rack On Tractor Keeps Surplus Skids Handy

Make this handy carrying rack for those skids you can never find at the right time. It is also good to have a place to put surplus skids without cluttering up the right-of-way or sending a truck down the line to spot the few shown.

When rain makes the right-of-way a strip of mud, this rack allows the sideboom to operate as a double duty rig, eliminating a truck and tow-cat.

Use Rainhood to Protect Exposed Pressure Recorder

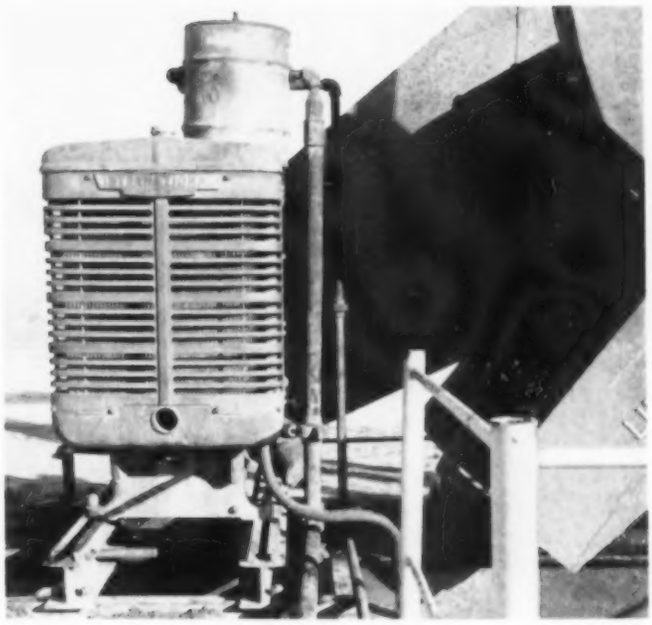
Here is a good way to protect those exposed pressure and temperature recorders. The ¼-inch plate "rainhood" is left open on one side for ease in observing recorder, at the same time the hood serves as a support for the instrument mounted at the back.

Equip the single two-inch pipe leg with a leveling saddle at the bottom as shown. This arrangement serves a double duty—to level the instrument properly on installation, and relevel it if the pier should settle or be moved.

Cover Sleeve Couplings To Permit Higher Pressures

One gas transmission company, wanting to increase the allowable pressure on an old gas line, used this simple sleeve to accomplish the job, while allowing the line to remain in service.

Sleeves were fabricated in two halves, slipped over the coupling, and welded up. The only disadvantage was the labor involved in stripping out the old coupling, and removing the coating on the line near it. After this part of the job was accomplished, all that was left was a welding job and repairs to the 'dope.' The sleeve is similar to any other leak-repair sleeve, except it must be wide enough to cover the entire coupling.

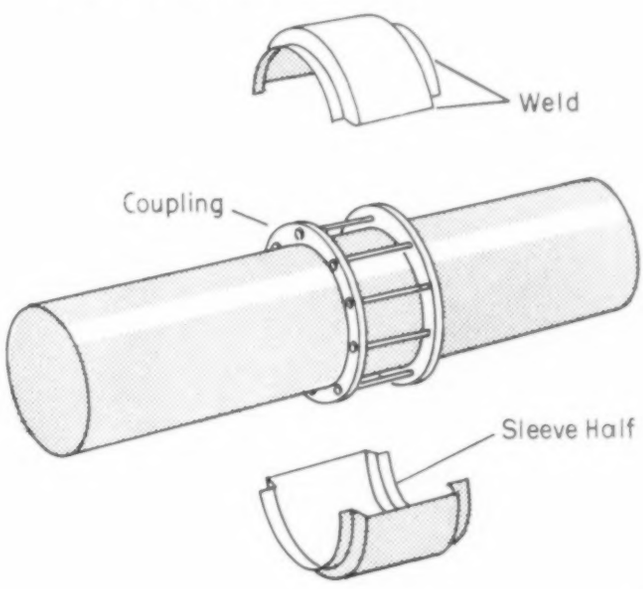


Make Exhaust Heater To Prevent Freeze-Ups

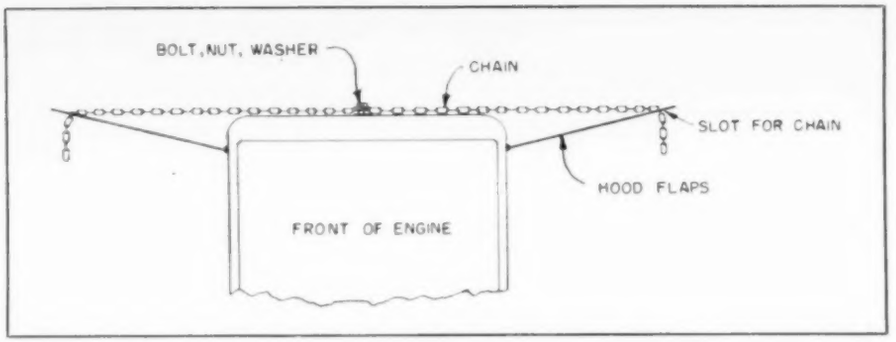
Use this simple rig to keep the regulators on field-unit fuel lines from freezing up. Put a used drum around the exhaust pipe and set the regulator inside. The height will have to be adjusted so the diaphragm will be kept warm, but not hot enough to damage it.

Have the welder making the heater check the following points:

- Clean the drum thoroughly before putting the torch to it, or fill it with an inert gas to assure the absence of a combustible mixture.
- Cut a hole in each end large enough for 1-inch pipe to go through—set the regulator inside and make up the nipples.
- Place the rig over the unit's exhaust, and make up the inlet and discharge lines.
- To feed more than one unit off the same regulator, bring the discharge line back to the ground and off to the next unit, as shown.



Keep Engine Hood Panels Up Safely



Hold the side panels of the engine hood out of your way safely and easily with an 8-foot length of chain as illustrated. Bolt the middle of the chain to the top of the engine hood, using a bolt, nut and washer.

A slot is cut in the bottom edge of the panel to accommodate the chain, holding the panel in the desired position while changing the oil or working on the engine. The chain will hang one-half on each side of the engine when not in use, and will always be available to serve its proper purpose. This solution eliminates the hazardous practice of propping the panels up with a stick or some handy tool.

A GOOD START.. for a Long Life!

● This RUBEROID pipe line asbestos felt over PITT-CHEM hot applied enamel will withstand the severe corrosion attacks this pipe line may meet. The quality control to rigid specifications of these products assures years of protection for this line against moisture and electrical forces, as well as soil stress and root attack. And when you start a job, a Day man is there to give the benefit of his experience for a good start . . . part of the *plus* in the service you get when you "DEAL WITH DAY."

Both of these products are stocked in Houston for immediate delivery when you're in a hurry.

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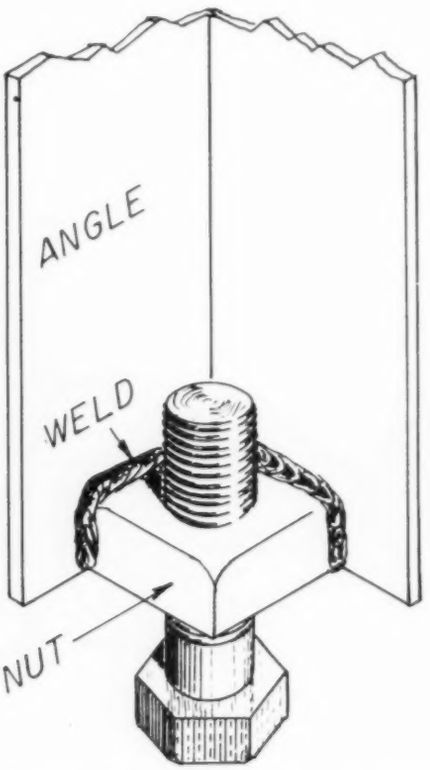


Keep Welding Slag Out of Nut Threads

A 1-inch bolt, welded to the leg of a shopmade table, is often used in leveling work benches or layout tables. In welding the nut to the inside of the leg, it is very difficult to avoid splattering weld metal into the threads of the nut.

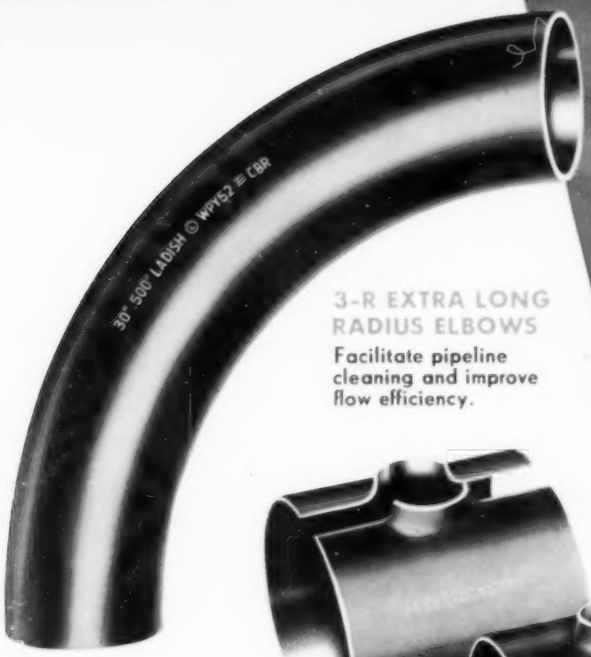
One shop foreman solved this problem by filling the nut with mud just prior to the welding job. When the nut had cooled enough to thread the bolt, a few blows with a hammer jarred all the mud loose and left a clean set of threads.

LADISH

Developments

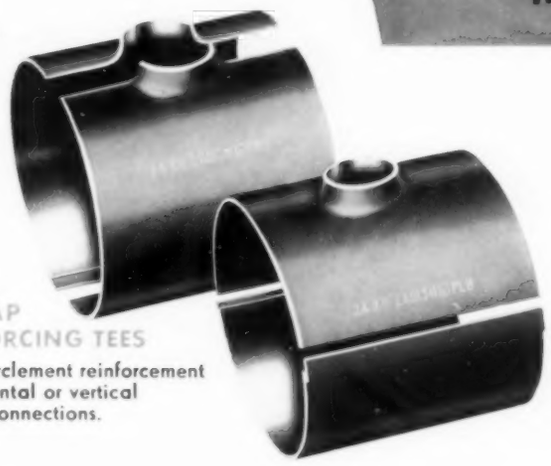
FOR THE PIPE LINE INDUSTRY

SPECIAL FITTINGS SOLVE INDUSTRY'S PIPING PROBLEMS



3-R EXTRA LONG RADIUS ELBOWS

Facilitate pipeline cleaning and improve flow efficiency.



HOT TAP REINFORCING TEES

Full encirclement reinforcement of horizontal or vertical branch connections.

Working closely with pipe line engineers, Ladish continues to pioneer fittings designed to simplify installation and improve transmission efficiency. Notable examples are illustrated on this page. To get more information on these developments . . . and the complete line of Ladish Controlled Quality pipe fittings, use the coupon below.

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In sizes through 42"
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MULTIPLE OUTLET FITTINGS

Reduce cost and simplify installation of gate settings.

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This 304-page reference manual presents complete data on the Ladish line of Controlled Quality Fittings . . . includes 56 pages of piping engineering data.

BULLETIN 55-1

21-page bulletin presents descriptive data on Ladish pipe line fittings developments.

BULLETIN 55-2

82-page volume tabulates and graphically charts design pressures for steel pipe for gas transmission and distribution systems in accordance with recently revised Section 8 of ASA. B-31.1.8.

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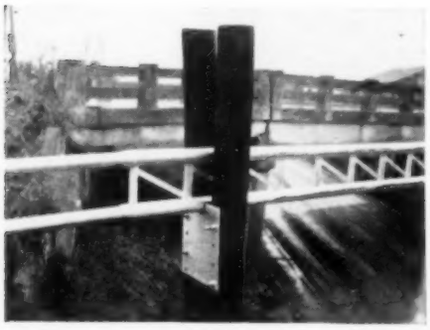
Place Handy Ash Trays At Station Entrances

One sure way of making station hands more mindful of smoking regulations is to place handy ash trays such as this one at all major entrances into "no smoking" areas around the station.

A short section of six-inch pipe is used for the tray. The upper end is cut at an angle and partially covered as shown. A one-fourth-inch circular steel plate is attached with pins to form a hinged lid and another is used for the tray bottom. The tray's support stand is a three-inch pipe section imbedded in the concrete walk and welded to the bottom of the tray.



Make Truss to Support Lines Across Underpass

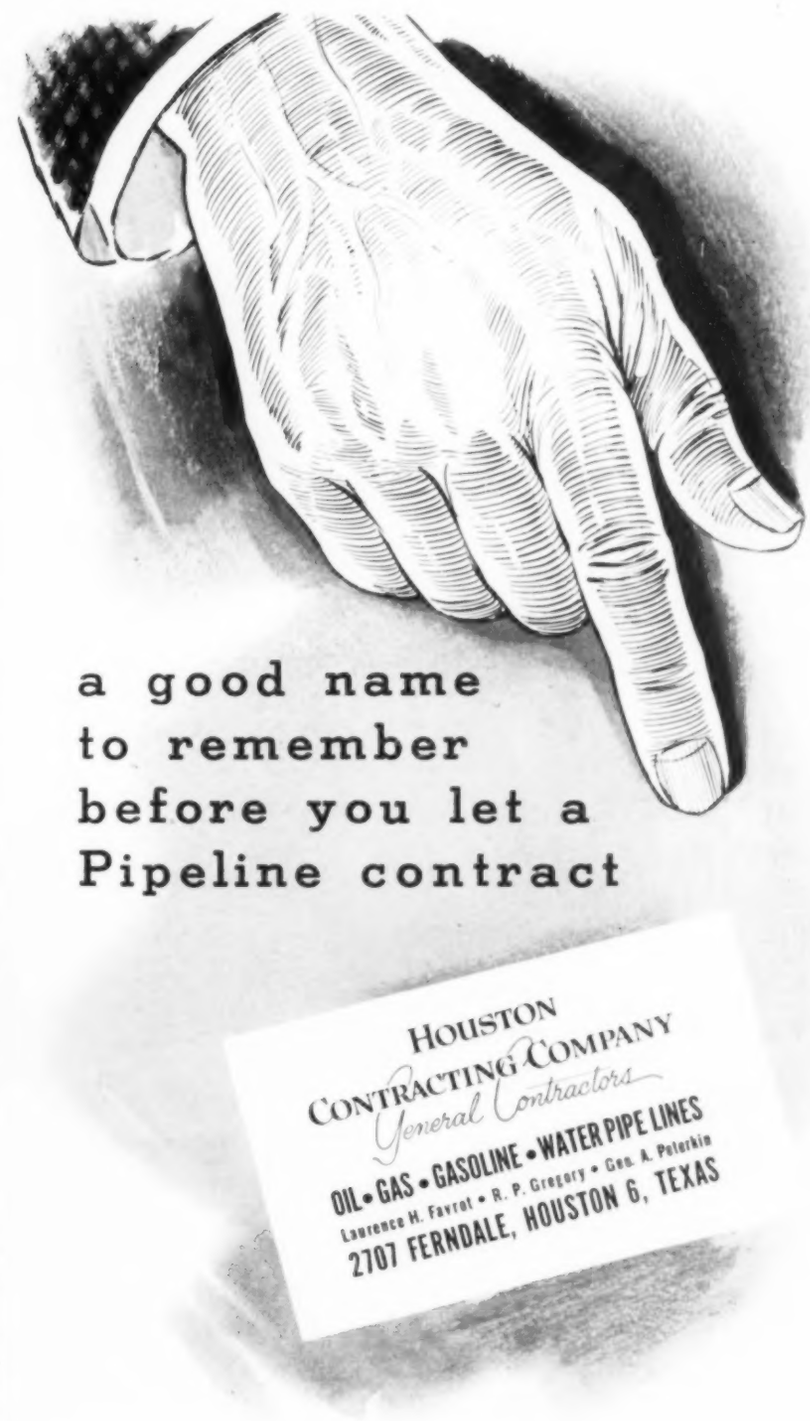
Make pipe lines support their own weight across spans like this, by turning the small diameter lines into horizontal members of a truss. The line itself is protected from welding effects by being encased in a slightly larger diameter pipe. To the outside pipe is welded a series of vertical and diagonal supports, the final job forming a complete truss.

The larger pipe, and support members may be made up in advance of the crossing and slipped over the lines at the correct time—welded into place, the job is done. The two creosoted posts shown keep the pipe lines in their correct upright position, while the steel plate supports them at the required height above the road. This installation eliminates 'dead men,' cables and 'A-frames' commonly used for such crossings.

Warning Panel of Lights Protects Field Station

Malfunctioning of equipment at this station is quickly discovered from this simple light panel installed in the station shack. Wired to the 110-volt lighting system, light bulbs representing each of the engine units are mounted on the panel. As long as the water jacket temperature, oil pressure, etc., remain within operating limits, the lights remain on.

When the pressure or temperature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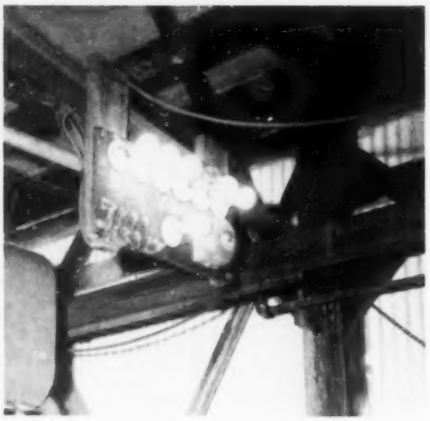

gets out of line on any engine, the light connected to that system goes out and a warning light just below goes on. At the same time, a "squawker" horn begins to sound. It is mounted beside the warning light as shown.

The picture shows the panel operating when the number 4 unit is malfunctioning. The attendant knows immediately which engine to check so that he can make the necessary adjustments or shut it down for repairs.

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HEAVY DUTY *Insulator for Big-Inch Pipelines in* **OVERSIZE** *Casings*

EXCLUSIVE "SLING JOINT" PREVENTS BAND FROM DIGGING INTO PIPE COATING

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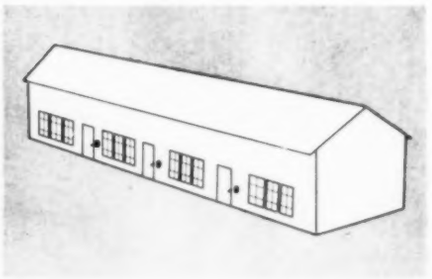
Weld Ears to Casing For Temporary Pump Mount

When water is needed at a station before construction is completed, a temporary mounting for a deep-water pump can be fashioned by welding four one-half-inch steel ears with triangle braces to the well casing. The pump is bolted directly to the casing as shown.

Temporary power for the pump can be supplied by an outside source such as an engine or motor using a drive shaft and universal joint. The low-cost mounting serves until a permanent foundation is completed.



Indicate Locations Of Fire Extinguishers

There need be no doubt at this pump or compressor station about where to find the fire extinguishers. The doors which have an extinguisher just inside them are painted with a large red circle. This feature may not seem important in routine maintenance, but, when there's a fire, who wants to take even a minute to locate the nearest extinguisher?

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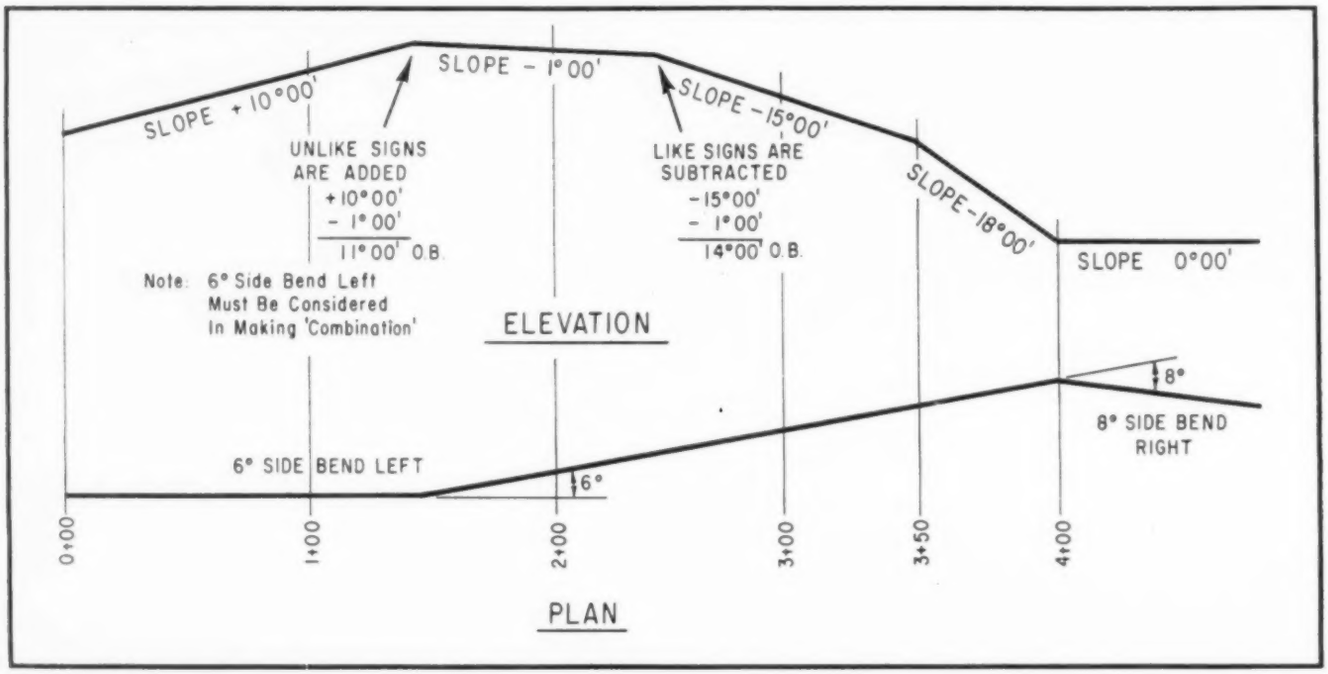
FOR THE PIPELINER'S NOTEBOOK

$15 Per Rule of Thumb

These formulae from the pages of engineers' own notebooks yield rough, but reasonably accurate answers for design, maintenance and supply questions. The Editors will pay $15 for your pet Rule of Thumb. Send your Rule of Thumb to PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1.



Pipe Line Construction —18—How to bend pipe to fit ditch—sags, overbends and combination bends.

To make straight sags or overbends fit the ditch (see drawing) add angles of unlike signs, subtract those of like signs.

Example: (Sta. 2 + 40)
Slope — 15° 00′
Slope — 1° 00′
(sub.) 14° 00′ overbend

In cases involving either a sag or overbend, in addition to a side-bend, the rule becomes: **Make the combination bend equal to the largest angle plus ⅓ of the smallest.**

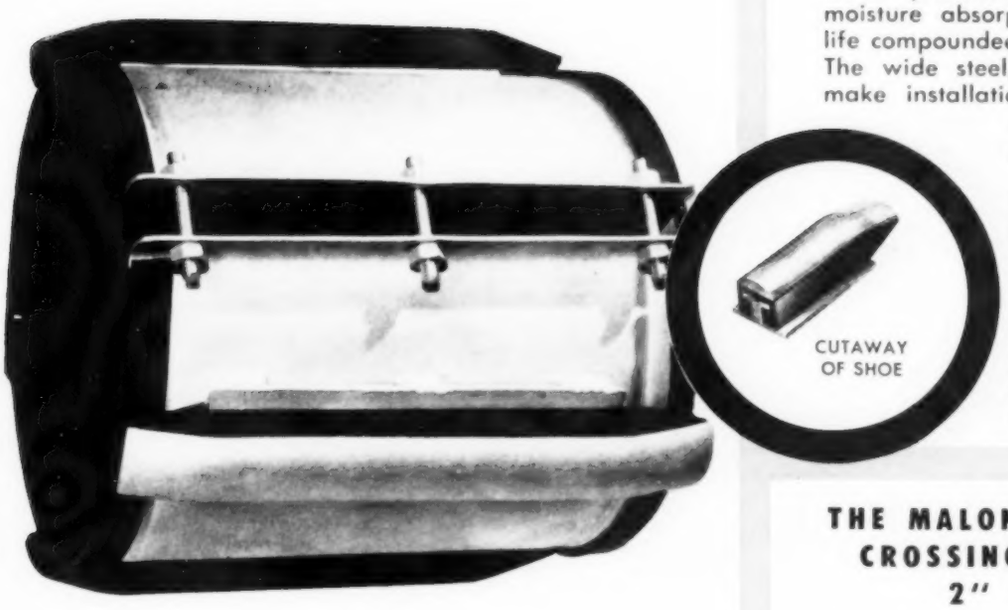
Example: (Sta. 1 + 40)
Slope + 10° 00′
Slope — 1° 00′
(add) 11° 00′ overbend (1)
6° 00′ side-bend left. (2)

Combination bend = 11° + (⅓ × 6°) = 13° 00′ overbend left.

Note: This rule gives an error of approximately 1° for a maximum bend of 18.5°—however, it can be more easily used in the field than the Rule of Thumb previously published (Pipe Line Construction—12). Results vary only slightly and this latest rule does not require square roots—only addition and subtraction.

MALONEY INSULATORS for any job

LARGE

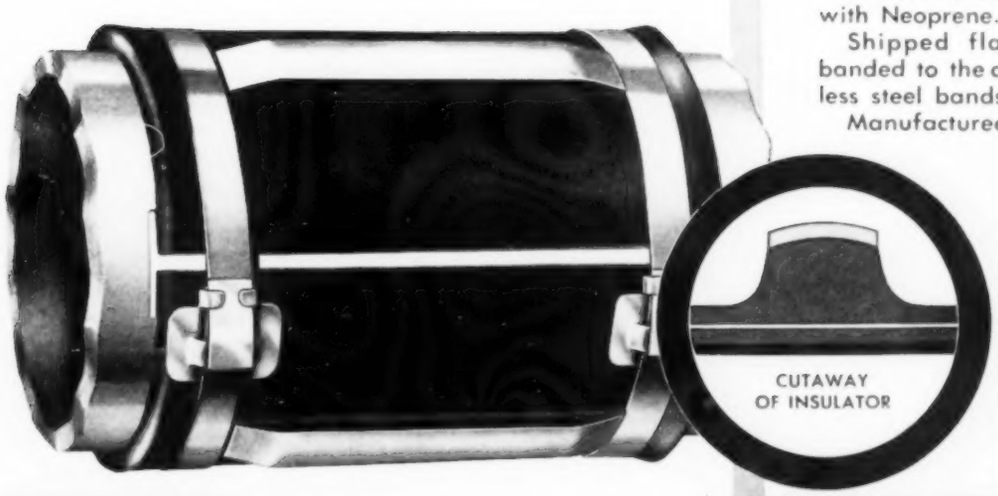


THE MALONEY MODEL 55 CROSSING INSULATOR FOR ALL SIZES OF PIPE

These insulators have superior insulation qualities because of the low moisture absorption and the long life compounded into the Neoprene. The wide steel, sled type runners make installation easy. The extra wide band affords a positive grip.

Bonded metal-to-Neoprene-to-metal, the runner insulates and also permits flexibility to compensate for pipe shifting and acts as a shock absorber to prevent damage due to sudden heavy loads.

or small



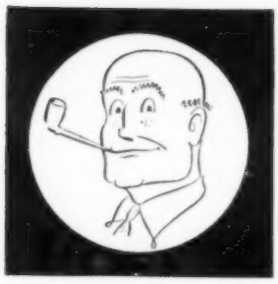
THE MALONEY MODEL 56 CROSSING INSULATOR 2" TO 12"

Manufactured with Neoprene, which is vulcanized to steel band core and to the rounded steel runners, there is no place to "short-out" between the casing and the carrier line. The steel core is completely surrounded with Neoprene.

Shipped flat, the Insulator is banded to the carrier pipe with stainless steel bands.

Manufactured in sizes from 2" thru 12", it can be used either on installations where there is only one nominal pipe size difference or on installations having a larger differential.

This is the Insulator designed and manufactured to give you the best job at a competitive price.



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Pipe Line Men

IN THE NEWS

R. R. Dean

Wilton E. Scott

Tennessee Gas Transmission Company has announced the promotion of two top executives. **R. R. Dean,** formerly vice president, was designated senior vice president in charge of manufacturing and marketing. **Wilton E. Scott,** exploration manager, was elected vice president. Dean is a veteran in the field of operating natural gas processing plants and marketing liquefiable petroleum gases. He is president of Bay Petroleum Corporation, subsidiary of TGT. Scott has had 20 years experience in exploration activities.

•

F. Cushing Smith is the new general manager of the Supply and Transportation department of **Standard Oil Company (Indiana).** Smith will direct and coordinate the Distribution Economics, Operations, Purchasing and Traffic departments. Smith replaces **Dr. Robert C. Gunness,** who was promoted to executive vice president to direct and coordinate operations of the company's Manufacturing Sales, and Supply and Transportation departments. Smith has been assistant to **Frank O. Prior,** president. He joined Standard Oil in 1943 as a chemical engineer at Whiting, Ind.

•

M. F. McQuinn, Houston, has been promoted to assistant manager of liquified petroleum gas sales for **Continental Oil Company.** Formerly an analyst in the company's Marketing Research division, he will continue to make his headquarters in Houston.

•

Robert L. Kidd and **Harry D. Hancock** have been elected directors of **Cities Service Company.** Kidd is president of Cities Service Oil Company (Del.) and Hancock is president of Cities Service Gas Company. Kidd joined the Cities Service organization in 1925 and became president of Cities Service Oil this year. Hancock became a junior engineer with Denver Gas and Electric Company in 1912. After assignments with Cities Service companies, Hancock became manager of the Natural Gas department of Cities Service Petroleum. He became president of Cities Service Gas November, 1956.

•

Gerald B. Bennett has been named acting division gas superintendent for **Sun Oil Company's** Southwest division. **Robert L. Sullivan,** formerly special assistant, has been named acting assistant division gas superintendent. Bennett, who has been assistant since 1947, succeeds **Benton E. Warren,** who recently moved into Sun's foreign operations.

Pipeliners Escape Injury In Plane Crash Near Dallas

Three men escaped serious injury recently in a plane crash in which the pilot, A. S. Crutcher, head of Crutcher-Rolfs-Cummings Company of Houston, pipe line equipment firm, deliberately crashed his plane to avoid hitting a group of children.

Crutcher and his passengers, L. H. True, president of Magnolia Pipe Line Company, Dallas, and J. A. Williamson, owner of Brazos Construction Company in Houston, were returning to Dallas from True's ranch when the plane's fuel supply was exhausted while circling Love Field for a landing. Crutcher decided to attempt a landing on a playground, the only clearing in sight.

Crutcher stalled his twin-engine Navion and was forced to belly-land the plane a distance away from the children on the playground. Most serious injury of the three was a broken nose sustained by True.

W. A. Ryan has been promoted to general superintendent of **Great Lakes Pipe Line Company.** In his 21 years of service with the company, Ryan has held numerous assignments in the Operating department, the last ten years as area supervisor of terminals stationed at Des Moines. During World War II Ryan served with the Army adding to his pipe line experience. Ryan helped to construct and later operate one of the first overseas pipe lines built under wartime conditions from Bone, Algeria, to a point near Bizerte, Tunisia.

W. A. Ryan

•

Leland S. Lovell, formerly assistant chief oil dispatcher for **The Buckeye Pipe Line Company,** has been appointed chief oil dispatcher at Lima, Ohio. Lovell succeeds the late **Paul E. Williams.**

•

Harold E. Vaughan has been named assistant to the vice president for gas supply for **Transcontinental Gas Pipe Line Corporation.** Before joining Transco, Vaughan had been superintendent of natural gasoline and gas operations for Continental Oil Company's CATC marine region. He has been with Continental for 17 years. Prior to his assignment with the offshore operation, Vaughan was assistant regional superintendent of natural gasoline and gas operations, southern region.

Harold E. Vaughan

•

Panhandle Eastern Pipe Line Company has announced a realignment of personnel in the supply area of the pipe line system and in its operating headquarters at Kansas City. **Robert B. Harkins** has been named assistant to the vice president and will be lo-

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cated in Kansas City. Functions of the Operating department have been separated into two divisions with **George B. McClellan** as general manager of the production and supply division with headquarters at Liberal, Kansas, and **Francis J. McElhatton** as general manager of the gathering and transmission division headquartered at Kansas City.

•

The following staff offices have been established: **Evan A. Thomas,** director of the office of resource planning at Liberal; **William C. Marris,** director of the office of operational planning and budgeting; **Herbert H. Duff,** director of the office of industrial relations, and **Lester A. Mussman,** director of the office of purchasing and stores. The latter three will be located at Kansas City. Appointments made within the Gathering and Transmission division are **Ernest O. Nelson,** assistant general manager; **Jack N. White,** superintendent of pipe line; **Kenneth E. Kalen,** superintendent of compressor; **Timothy J. Kirkpatrick,** superintendent of gas measurement; **Cecil Van Gundy,** superintendent of pressure control; **Stephen A. Bergman,** chief engineer; **James A. Fowler,** manager of communications; and **Glenn L. Bowman,** manager of transportation.

A. F. Hagen

R. N. Knott

A. F. Hagen has been named to succeed **C. C. Combs,** vice president and treasurer of **Shell Pipe Line Company.** Hagen is now manager of Shell Oil Company's Houston area Treasury department. Combs will move to New York as treasurer of Shell Oil Company. Replacing Hagen as treasury manager will be **R. N. Knott,** chief accountant at Shell's Pacific Coast area in Los Angeles.

Hagen rose through various financial positions on the West Coast, becoming assistant general auditor in San Francisco in 1945. He was serving in this capacity when he came to Houston in 1949 as treasury manager. Hagen will remain in Houston in his new assignment. Knott joined Shell in 1937 at Houston as senior clerk. He has been chief accountant in Houston, and auditor and senior auditor in New York. In 1952 Knott moved to Los Angeles as chief accountant.

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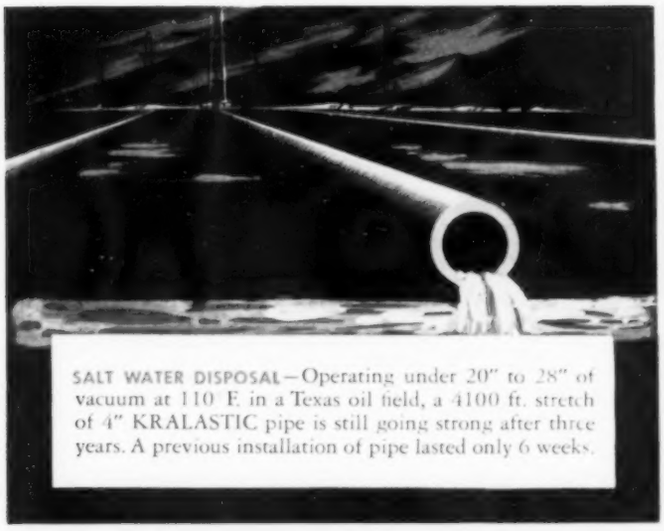
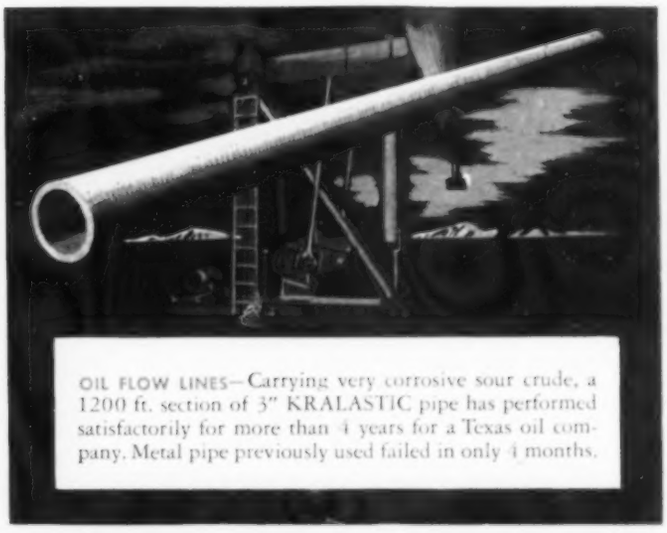
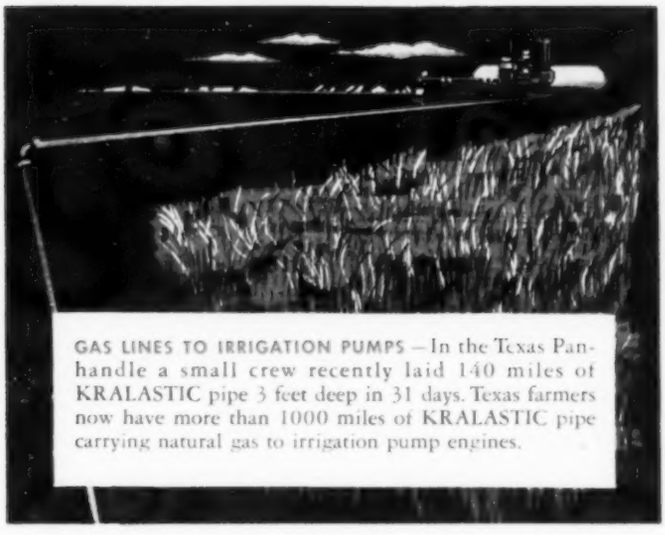


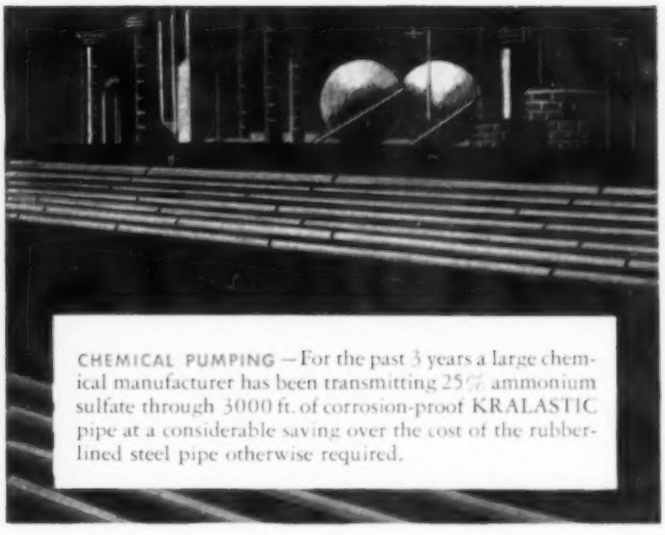
SALT WATER DISPOSAL—Operating under 20" to 28" of vacuum at 110° F. in a Texas oil field, a 4100 ft. stretch of 4" KRALASTIC pipe is still going strong after three years. A previous installation of pipe lasted only 6 weeks.



OIL FLOW LINES—Carrying very corrosive sour crude, a 1200 ft. section of 3" KRALASTIC pipe has performed satisfactorily for more than 4 years for a Texas oil company. Metal pipe previously used failed in only 4 months.



GAS LINES TO IRRIGATION PUMPS—In the Texas Panhandle a small crew recently laid 140 miles of KRALASTIC pipe 3 feet deep in 31 days. Texas farmers now have more than 1000 miles of KRALASTIC pipe carrying natural gas to irrigation pump engines.



CHEMICAL PUMPING—For the past 3 years a large chemical manufacturer has been transmitting 25% ammonium sulfate through 3000 ft. of corrosion-proof KRALASTIC pipe at a considerable saving over the cost of the rubber-lined steel pipe otherwise required.

KRALASTIC®, a unique combination of plastic and elastomeric materials, is different both in composition and physical properties from other materials used in the making of plastic pipe. It produces pipe—and many other plastic products—that are both hard and tough, low in weight, high in tensile strength and unaffected by most chemicals that corrode metals.

Pipe extruded of KRALASTIC has been approved by the National Sanitation Foundation for underground water transmission lines. Because of the inert nature of KRALASTIC, this pipe will not add taste or odor to drinking water and will not corrode and scale internally to cut down flow and pressure. For more information on KRALASTIC, write or phone us.

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WHO'S MEETING WHERE

January

Pipe Line Contractors Association, Ninth Annual Convention, Boca Raton Hotel and Club, Boca Raton, Fla., Jan. 14-16, 1957.

American Institute of Electrical Engineers, 1957 Winter General Meeting, Hotel Statler, New York, Jan. 21-25.

Southern Calif. Meter Assoc. & Los Angeles Harbor Junior College, Sixth Annual Instrument Short Course, Los Angeles Harbor Junior College, Jan. 31-Feb. 1.

NACE, Houston Section, Corrosion Short Course, University of Houston, Jan. 31-Feb. 1.

February

Society of the Plastics Industry, 12th Annual Technical and Management Conference of Reinforced Plastics Division, Edgewater Beach Hotel, Chicago, Feb. 5-7.

NACE, Tulsa Section, Corrosion Short Course, Mayo Hotel, Tulsa, Okla., Feb. 13-15.

American Society of Civil Engineers, Pipeline Division, Jackson, Miss., Feb. 19-20.

March

American Society of Photogrammetry, American Congress on Surveying and Mapping, Shoreham Hotel, Washington, D. C., March 3-9.

NACE, 13th Annual Conference and Exhibition, Kiel Auditorium, St. Louis, Mo., March 11-15, 1957.

New England Gas Association, Annual Meeting, Hotel Statler, Boston, Mass., March 21-22, 1957.

Mid West Gas Association, Hotel Nicollet, Minneapolis, March 25-27.

April

NACE, Central Oklahoma Section, and University of Oklahoma Corrosion Control Short Course, Univ. of Okla. Extension Study Center, Norman, April 2-4.

Petroleum Equipment Suppliers Association, Palm Springs, Calif., April 6-11, 1957.

Industrial Accident Prevention Association, Royal York Hotel, Toronto, Canada, April 8-9.

AGA Distribution, Motor Vehicles and Corrosion Conference, Rice Hotel, Houston, April 8-11.

American Welding Society, Sheraton & Bellevue Stratford Hotels, Philadelphia, April 8-12.

Petroleum Industry Electrical Association & Petroleum Electric Supply Association, 29th Annual Conference and Exhibits, Shamrock-Hilton Hotel, Houston, April 15-18.

Southwestern Gas Measurement Short Course, College of Engineering, University of Oklahoma, Norman, April 16-18.

National Petroleum Association, 54th Annual Meeting, Cleveland Hotel, Cleveland, April 16-18.

Southern Gas Association, Annual Convention, New Orleans, April 29-May 1.

May

API Annual Pipe Line Conference, Cleveland Hotel, Cleveland, May 6-8.

Fluid Control Institute, Greenbriar, White Sulphur Springs, W. Va., May 8-11.

AGA Gas Supply, Transmission and Storage Conference, Mark Hopkins Hotel, San Francisco, May 9-10.

API Safety and Fire Protection Committees, Hotel President, Kansas City, Mo., May 13-17.

ASME, 29th Annual Conference and Exhibit of Oil and Gas Power Division, Kentucky Hotel, Louisville, Ky., May 20-23.

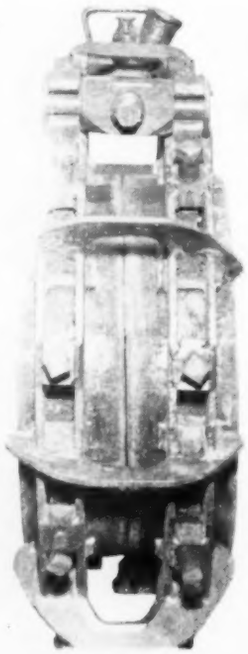
June

Appalachian Underground Corrosion Short Course, West Virginia University, Morgantown, W. Va., June 5-7.

ASTM, Chalfonte-Haddon Hall, Atlantic City, N. J., June 16-21.

Michigan Gas Association, Grand Hotel, Mackinac Island, Mich., June 24-25.

American Institute of Electrical Engineers, Sheraton-Mt. Royal Hotel, Montreal, Canada, June 24-28.



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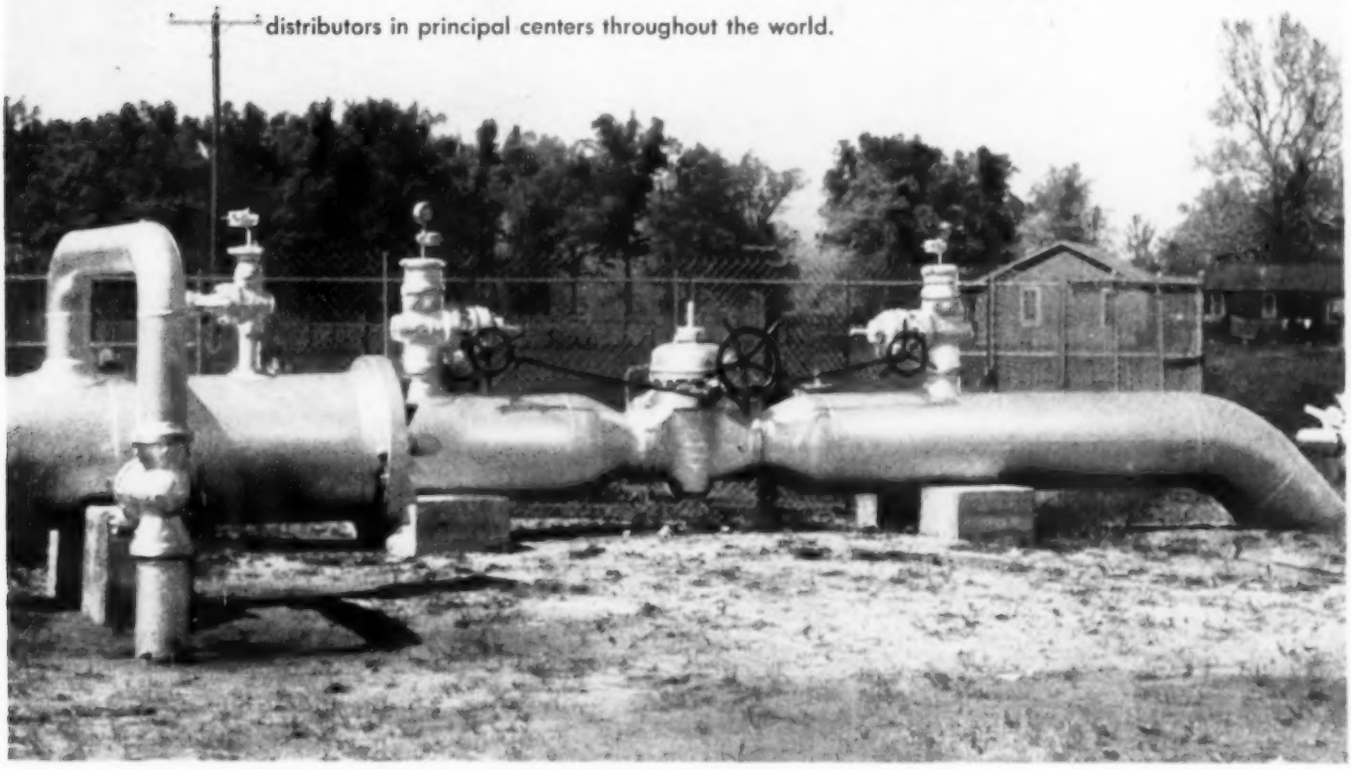

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NEW BOOKS

National Petroleum Bibliography, First Edition, Box 3586, Amarillo, Texas, Annual subscription price, $35.

An advance edition of a new type periodical publication devoted to the petroleum industry has been announced by the publishers. Designed for use as a desk top library file by executives, petroleum technologists and researchers, the National Petroleum Bibliography is a bimonthly index of literature and data pertinent to oil industry operations.

More than 400 publications per issue are indexed in the new bibliography, which also includes current books, technical papers, maps and various special publications of oil and gas agencies and institutions. Bibliographical listings are indexed under the Uren decimal system, widely used by oil companies in filing technical data. Information relative to all divisions of the industry is classified under specific numbers and headings. A sample copy of the 121-page first edition may be obtained by writing the publishers.

•

Snake Bite Manual, Gordon P. St. Clair, National Safety Council, 425 North Michigan Avenue, Chicago 11, Ill.

Specialized safety training is recommended for persons whose employment requires their entering areas likely to be inhabited by poisonous snakes. The National Safety Council has prepared a 50-page book on the habits of snakes, safety measures to be observed and instructions on the selection and use of emergency equipment. The book is well illustrated, showing how to wear protective clothing, how to identify poisonous snakes, and how to administer first aid.

The chapter on safe practices is of interest to persons working on pipe lines as it outlines safety measures to be followed while walking and working in areas of brush and grass, how to approach or move obstacles in paths, how to cross streams or ditches where snakes may be hidden, etc. The book includes a chapter on treatment for medical directors' reference.

•

Historical Statistics of the Gas Industry, American Gas Association, 420 Lexington Avenue, New York 17, New York, $5.

This is a complete compilation of all available statistical information for all years up to and including 1954. The publication is arranged in a comparable manner to that used in the new "Gas Facts" and tables are cross-referenced to facilitate the location for data for earlier years than those which appear in "Gas Facts." It is anticipated that this compilation will be issued every five years and supplementary sheets will be distributed annually in intervening years to keep volumes up to date. This volume supplements "Gas Facts" and "Gas Data Book."

•

Engineering Formulas and Tables, Lefax Publishers, Philadelphia 7, Penn., $2.75.

This newly-revised data book contains 350 pages of basic formulas, design data and tables for civil, mechanical and electrical engineers. Condensed, indexed and mathematically accurate, 12 division sheets with printed tables furnish immediate access to the information desired. Sections include mathematics, measures, materials, gages, screws, mechanics, electricity and magnetism, hydraulics, structural data, reinforced concrete, pipe and fittings, steam tables and mathematical tables.

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What's Happening

AMONG SERVICE AND SUPPLY MEN

Bryant Is Field Representative For Perrault Equipment Company

Walter Bryant has joined Perrault Equipment Company as Southwest district field representative. Bryant will service pipe line contractors and oil and gas companies with the Perrault Equipment line of equipment and supplies, including coating and wrapping and cleaning and priming machines, pneumatic internal line-up clamps, cradles, slings and pipe protection materials.

Walter Bryant

Formerly Bryant was with Stanolind Exploration and Arey Construction Co., Pampa, Texas.

Austin Completes 39 Years Of Service with U. S. Steel

David F. Austin, executive vice president—commercial, United States Steel Corporation, retired December 31 after almost 39 years of service. Richard F. Sentner, presently assistant executive vice president—commercial, succeeds Austin.

Austin began his career with U. S. Steel in 1918 in New York. After several assignments in sales, he became vice president—sales of Carnegie-Illinois Steel Corporation in 1938. He became vice president of U. S. Steel of Delaware in 1945 and several years later became executive vice president—commercial of United States Steel Company. Since 1953 he has held the same position with U. S. Steel Corporation.

Sentner joined U. S. Steel Corporation of Delaware in 1948 as assistant vice president—sales. With formation of the United States Steel Company in 1951, Sentner became assistant executive vice president—commercial and retained that position when the United States Steel Corporation became an operating concern in 1953.

Mauthe and Glossbrenner Named to Youngstown Posts

J. L. Mauthe has been elected chairman of the board of The Youngstown Sheet and Tube Company. A. S. Glossbrenner, former vice president of operations, has been elected president, succeeding Mauthe. Walter E. Watson, former first vice president, has been elected vice chairman of the board.

Other elections are William H. Yeckley, former manager of steel operations to vice president of operations and Frederick M. Mayer, president of Continental Supply Company (a former Sheet and Tube subsidiary, and now a division) to vice president.

Friedlander Heads Department At L. O. F. Glass Fibers

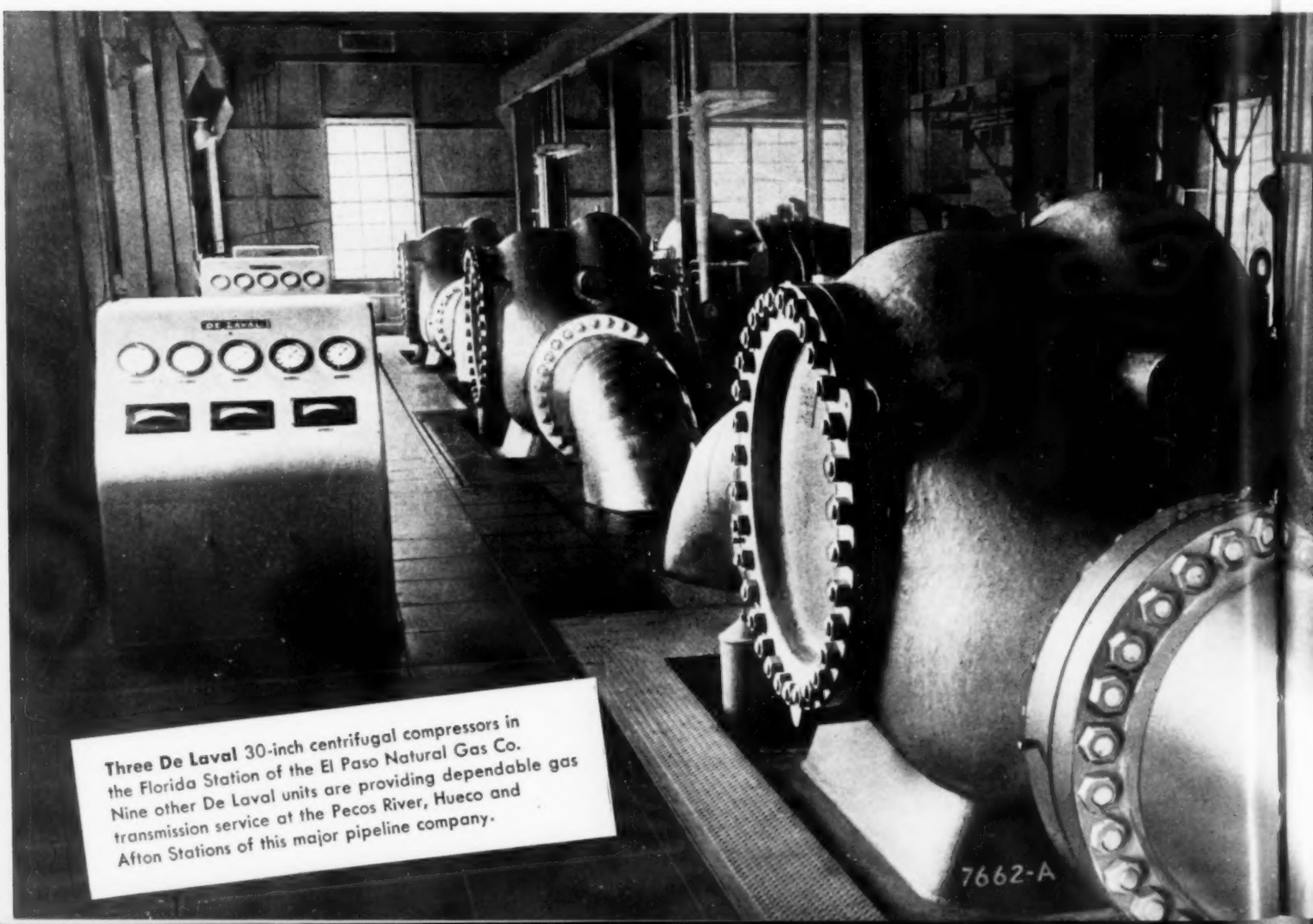
Blair Friedlander has been appointed manager of the Textile Fabricating department at the Parkersburg plant of the L. O. F. Glass Fibers Company.

Blair Friedlander

Friedlander has been assistant manager of the department for three years and was a shift foreman a year prior to assuming that post. He was associated with Libbey-Owens-Ford Glass Company and American Viscose Corporation before joining L. O. F. Glass Fibers Company.

McKinney Named Representative For Frank Wheatley Firms

Frank Wheatley, Jr., president, announces the appointment of I. W. (Dub) McKinney as special representative of



Three De Laval 30-inch centrifugal compressors in the Florida Station of the El Paso Natural Gas Co. Nine other De Laval units are providing dependable gas transmission service at the Pecos River, Hueco and Afton Stations of this major pipeline company.

Frank Wheatley Pump & Valve Mfg. Co. and Frank Wheatley Supply Company with offices in Houston.

C-R-C Acquires Rights To Industrial Machine Co.

Crutcher-Rolfs-Cummings, Inc. has acquired certain manufacturing rights formerly held by Industrial Machine Company of Oklahoma City.

Ken Defenbaugh

Under the new arrangement, Ken Defenbaugh, formerly a partner at Industrial Machine, is now with C-R-C.

C-R-C. distributors of Koehring excavators, Parsons' trenchers, Esco points and buckets, as well as C-R-C pipe line construction equipment, will manufacture C-R-C IMCO pipe bevelers, C-R-C kelly rippers and a new electro-hydraulic C-R-C line-up clamp.

Sales Appointments Made By General Electric

General Electric Communication Products department has disclosed three appointments in its field sales organization.

V. E. Stineman is named district manager at Los Angeles. Stineman's appointment was announced by I. M. Ellis, regional manager for the department at Redwood City. He succeeds Kent Worthen, who has joined the Communication Products headquarters staff at Syracuse, N. Y.

John F. Conley, formerly General Electric district sales manager for communication equipment at Syracuse, becomes district representative for a new office established in Miami, according to Fred W. Hall, Florida district manager, who has offices at Jacksonville.

Howell Ray Epps has been designated as communication engineer at Dallas with responsibility for supervision over installation and maintenance of General Electric mobile radios in vehicles and offices of public safety agencies and commercial firms. His new duties also include the training and guidance of independent service station technicians who maintain General Electric products.

Conley and Stineman will handle the sale of G-E communication equipment to municipal agencies, taxi companies, the highway construction field, the oil, concrete and trucking industries and other businesses in their areas.

Bucyrus-Erie to Build New Drill Plant in Indiana

A new 12 million dollar drill manufacturing plant will be built near Richmond, Ind. by Bucyrus-Erie Company. Work will begin soon with completion scheduled for late 1957 or early 1958. The new plant will employ about 1000 people.

Machines to be manufactured at the Richmond plant include water well drills, shallow oil well drills, and blast hole drills. These drills are now manufactured at the South Milwaukee and Evansville plants. Space vacated at these plants will be used to expand production of excavating machinery.

F. M. Mayer

W. T. Powell

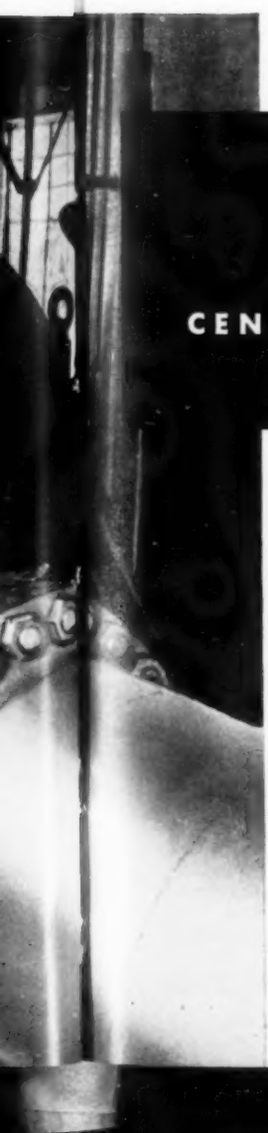
Merger of Continental Supply And Emsco Manufacturing Announced

J. L. Mauthe, chairman of The Youngstown Sheet and Tube Company, has announced that on January 1 its Continental Supply Company and Emsco Manufacturing Company divisions were consolidated into one division to be known as Continental-Emsco Company.

F. I. Brinegar

General offices are in Texas. Frederick M. Mayer, president of Continental and recently elected vice president of Youngstown, will be president of the new company.

William T. Powell will be executive



DE LAVAL

CENTRIFUGAL COMPRESSORS

on the job at El Paso Natural Gas

De Laval centrifugal compressors offer many important engineering features. (1) They are designed to handle an increased ultimate flow, can be quickly converted to larger capacities by replacing the impeller, diaphragm and a few minor parts. (2) The high pressure shaft seal eliminates leakage, consumption of sealing oil is negligible. (3) There is only one moving part—the rotor—which has ample clearance. (4) Units are compact, require smaller foundations and smaller stations. (5) First costs and installation costs are low.

Bulletin 503 gives data on De Laval Centrifugal Compressors. Write for your copy.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY

884 Nottingham Way, Trenton 2, New Jersey

DL375

vice president in charge of manufacturing and engineering, and Frank I. Brinegar will be executive vice president in charge of distribution. Vice presidents of Emsco and Continental, W. C. Kinder, D. M. Bailey, and Raleigh Hortenstine, Jr., will continue as vice presidents in the new company. In addition, J. A. Mussler has been appointed a vice president and will be in charge of all tubular sales (steel, aluminum, and plastic) as well as all pipe line equipment. Kinder will be in charge of machinery and allied sales.

Morris-Young-Owens Moves to New Building

Morris-Young-Owens Company, manufacturers of pipe line construction equipment, has moved its offices in Houston to a new location at 14000 South Main. The office includes a new warehouse and shop to handle sales and supplies of all types.

Jones & Laughlin Dedicates New Headquarters Building

Jones & Laughlin Supply Division's new $1,700,000 headquarters building in Tulsa was recently dedicated by Admiral Ben Morecll, Jones and Laughlin Steel Corporation chairman, and other company executives.

The new building houses a central warehouse and supply store, as well as offices for the 300 headquarters personnel. From the Tulsa headquarters, the division directs operations of 27 district and sales offices and 90 oil field supply stores in 17 states and three provinces in Canada.

Speakers at the dedication ceremonies included C. L. Austin, vice chairman of the board, Pittsburgh; John E. Timberlake, vice president—sales, Pittsburgh; Rainey Elliott, president, Jones & Laughlin Supply division, Tulsa; and W. L. Wolfe, vice president—sales, Jones & Laughlin Supply division, Tulsa.

It's A

Cinch

We Are

looking forward to seeing YOU in Boca Raton, Florida, during the 1957 Pipeline Contractors Association Convention.

PAUL BARKLEY, President CALVIN A. BARKLEY, Vice-President

TRENT W. AVERA

Cinch Pipe Bending Machines Cinch Outside Line-up Clamps

PIPE BENDERS LINE-UP CLAMPS

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PIPELINE EQUIPMENT, Inc.

7020 Long Drive Houston, Texas

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Richard D. Boutros

Milton Dykman

Boutros, Shufelt, Dykman Promoted at Mixing Equipment

Richard D. Boutros has been advanced from chief engineer to vice president and director of engineering at Mixing Equipment Co., Inc. Boutros has served as chief engineer since January, 1949. He joined the engineering staff in 1946.

Howard C. Shufelt

Milton Dykman has been promoted to chief engineer and Howard C. Shufelt becomes assistant to the chief engineer. Dykman has been assistant chief engineer since 1951 and has been associated with Mixing Equipment Company since September, 1946. Shufelt has been with the firm since 1955.

Greer Named to Sales Post With International Harvester

Ralph G. Greer has been appointed assistant sales manager of the Construction Equipment Division of International Harvester Company, succeeding C. E. Jones, who has been named supervisor of national contractors' sales.

R. G. Greer

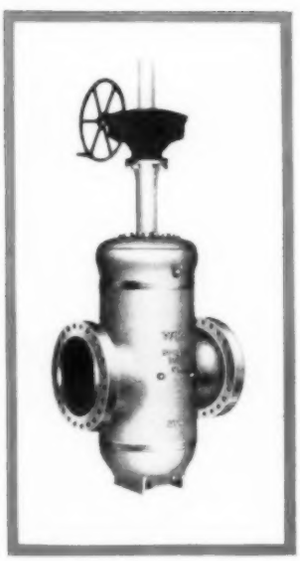
Greer joined International Harvester at its Minot, N. D., district office in 1933. He held several positions in sales until 1940, when he was appointed assistant district manager at Mason City, Iowa, and later served in that same capacity at Quincy, Ill., and Salt Lake City, Utah.

From 1942 to 1946, Greer served in the U. S. Navy. In 1946 he was appointed assistant regional manager of motor truck sales, eastern region. He later was transferred in the same capacity to the company's central region and in 1948 was appointed regional manager of motor truck sales for Harvester's western region.

In 1951, Greer was made manager of the company's Detroit military products office and served in that position until 1953, when he was returned to the motor truck division as regional manager for the east-central region. Greer was appointed manager of Harvester's Washington, D. C., office in 1954 and has served in that capacity until the present time. He will be succeeded in the Washington

W-K-M Valves—

have all the features* essential for safe, successful hot tapping



* Through-conduit assures a free, unobstructed passageway for tapping bit.
* Parallel expanding gates provide positive upstream and downstream seal.
* Completely protected, seats cannot be damaged during tapping operation.
* When tapping machine is removed and valve is closed and opened, the shavings are dumped directly into the line . . . cannot interfere with valve operation.

When tap is completed—and bit removed—your new take-off line will have the industry's finest pipeline valve, ready to give you years of dependable service. Talk to your W-K-M representative about the money-saving performance and versatility of W-K-M Pipeline Valves. W-K-M Division of ACF Industries, Incorporated. Plant: Missouri City, Texas. Mailing Address: P. O. Box 2117, Houston, Texas.

5618

W-K-M
DIVISION OF ACF INDUSTRIES INCORPORATED

MANUFACTURERS OF W-K-M GATE VALVES ACF LUBRICATED PLUG VALVES KEY-KAST ALLOY STEEL PIPING FITTINGS KEY RETURN BENDS AND FITTINGS

office by Thomas E. Aughinbaugh, former central regional manager, motor truck sales, who also will have jurisdiction over the Detroit military products office.

Jones, in his new position, will concentrate his efforts on the large users of construction equipment. He will work closely with the construction equipment division's entire sales organization as well as with the company's distributor organization.

Cash Standard Appoints Schupner Chief Engineer

A. W. Cash Company and its subsidiary, Cash Standard Stacon Corporation, have announced the appointment of William Schupner as chief engineer for fluid power products.

Schupner formerly was chief research engineer for Hanna Engineering Works in Chicago.

Robert L. Knox

Herman R. Brown

Assistant Sales Managers Named by Frank G. Hough Co.

Robert L. Knox and Herman R. Brown have been appointed assistant sales managers of The Frank G. Hough Co.

Knox, who was a district sales representative, will take charge of distributor sales and contacts with field personnel. Brown, formerly manager of the Order and Distribution section of the Sales department, assumes direction of manufacturers sales including export, government and supplemental equipment as well as scheduling operations.

Bethlehem Supply Announces New Personnel Changes

The Panhandle-Western district office of Bethlehem Supply Company has moved into new quarters in the Petroleum Building in Amarillo, Texas.

J. T. Allen, formerly assistant store manager at Kermit, Texas, has been promoted to store manager and field representative at that point.

C. W. Young, special representative for the Kansas district, has moved his headquarters from Russell to Great Bend.

Johnson Named Controller Of L. O. F. Glass Fibers Co.

Robert H. Johnson has been appointed controller of the Pacific Coast division, L. O. F. Glass Fibers Company. Johnson was office manager of Pioneer Oldsmobile Company and Moran Motors, an accountant with Southern California Gas Company and cost accountant with Bechtel, McCone & Parsons Corporation.

R. H. Johnson

Johnson was graduated from the University of California at Los Angeles.

Heiman Named Purchasing Agent For Rockwell Instrument

Joseph A. Heiman has been named purchasing agent for Rockwell Manufacturing Company's Instrument division at Tulsa. Heiman formerly was a senior buyer in Rockwell's General Purchasing department at Pittsburgh. He is succeeded by James N. Huber, formerly purchasing agent with Fort Duquesne Steel Company and Keystone Fabricating Company, both of Pittsburgh.

McCormick to Manage Sales At Koehring Ohio Division

E. S. McCormick has been named general sales manager for the Buffalo-Springfield Roller division of the Koehring Company. Buffalo-Springfield recently was merged into the Koehring organization.

E. S. McCormick

The new sales manager will be in charge of sales activities for the Buffalo-Springfield line of products which includes road rollers and soil compaction equipment.

McCormick's appointment will shift him from his present duties with the Koehring Company as special railroad sales representative.

ARCCO
ARCCO-Anubis
CONTINUOUS GAS SAMPLER
MEETING THE DEMAND for more accurate gas sampling, this newly perfected ARCCO-Anubis instrument replaces inadequate, inaccurate spot sampling methods. The Model 100-7 will over a period of seven days accumulate at a constant rate a sample of gas to a final pressure at or near 100 psig from a sample source, the minimum pressure of which is not less than 125 psig.
The ARCCO-Anubis design is based on the principle that maintenance of a constant rate of increase in gas pressure within a closed container, from zero to any selected maximum pressure, will result in a continuous rate of flow of gas into the closed container.
This is accomplished by means of a specially designed regulation system equipped with a precision drive mechanism so as to obtain a constant predetermined rate of increase in the outlet pressure into the sample container.
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AVAILABLE FOR EARLY DELIVERY
AMERICAN RECORDING CHART CO.
3113 E. 11th St. Los Angeles 23, Calif.
Send for Bulletin No. 112-R1

For more data on advertised products, use Readers' Service Cards, last page.

the INSLEY "pipeliner" ...a machine built for pipeline work

The Insley "Pipeliner" is the hard-working answer to the contractor's need for a machine especially designed for pipeline work . . . a machine with "built-in" durability and stamina that will withstand the severe operating conditions of cross-country pipelining.

- **Wide, deep carbody with removable bottom cover plates**
- **Crawler rollers and tumblers sealed against dirt**
- **Two-speed travel (optional) through two-speed transmission .8 M.P.H. and 1.6 M.P.H.**
- **Increased stability and flotation with 12'-6" crawlers and 24" or 30" shoes**
- **Long wearing, heat-treated, alloy steel crawler shoes and pins**

The "Pipeliner" is fully convertible for hoe, shovel, dragline, clamshell and crane work, and is available with gasoline or diesel power. See your Insley distributor for full details or write direct to Insley.

Let Your Insley Distributor Show You an Insley at Work

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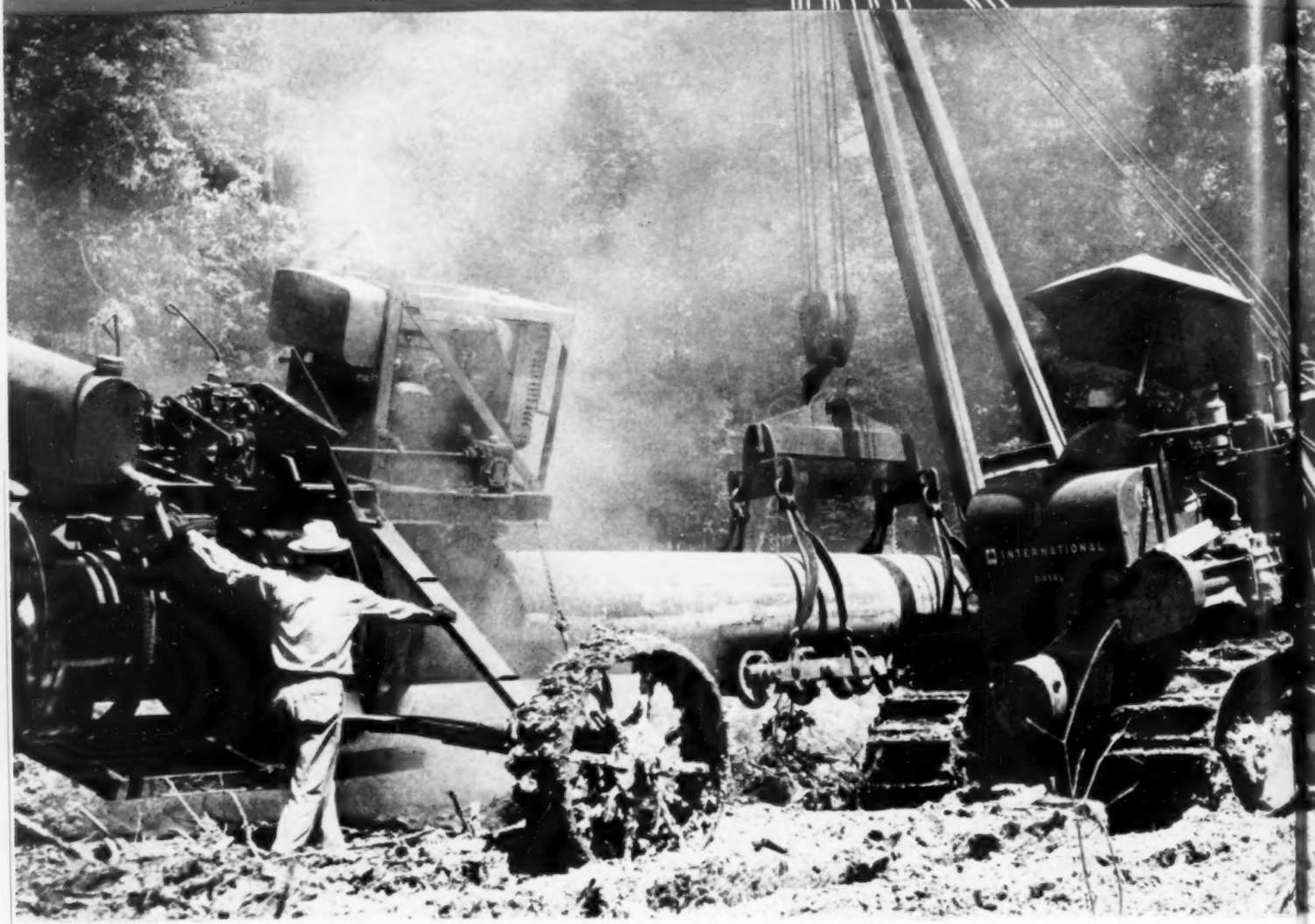
INSLEY MANUFACTURING CORPORATION
INDIANAPOLIS, INDIANA

wholly owned subsidiary / THE MAXI CORPORATION, LOS ANGELES

ONLY NEW

International® Superior TD-24

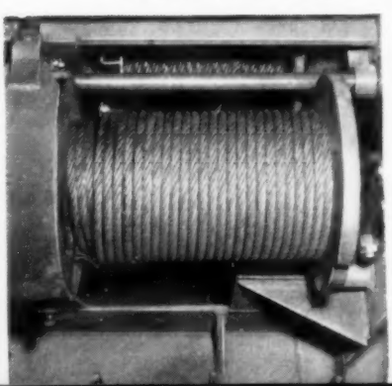
give you these terrain-beating, job-speeding



EXCLUSIVE:

You get super-fast control with minimum operator effort — with International Superior Pipeboom reach-easy control lever clusters. Load line is fully enclosed in heavy box-section for maximum safety to operator. The rugged boxed cable guard also serves as a rigid frame cross-tie.

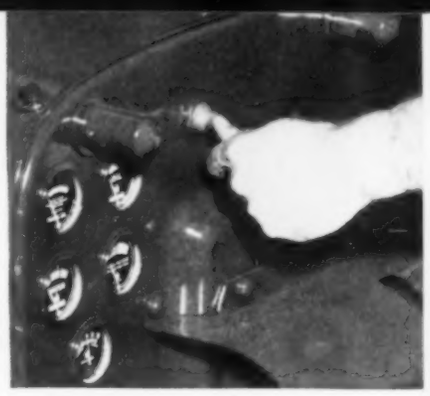
EXCLUSIVE:



You get wear-saving cable alignment — with individual drum shaft mountings to position the cable. This exclusive design increases sheave life, as well as providing straight line center-to-center cable pull from boom and load sheaves to drum.

4 pipebooms

advantages



EXCLUSIVE:

You get time-saving, capacity-adding maneuverability and load control that no other boom unit delivers—uphill or down! Exclusive International TD-24 Planet-Power steering is the reason. You "feed" full-time live power to both tracks to insure *positive* steering and *positive* traction. Exclusive finger-tip hydraulic braking and foot decelerator add to positive load control.

EXCLUSIVE:

You get hour-saving, seconds-fast all-weather International gasoline conversion diesel starting — that conditions the TD-24's engine seconds-fast for full-diesel, full-capacity operation. Get up to 15% *bonus pipe-laying time daily* in cool weather, especially, with this fast, genuine, in-seat push-button starting!

EXCLUSIVE:

You get a big mud-beating margin of flotation—because TD-24 boom units put 14% to 18% less poundage psi on the tracks than other makes. With this extra *flotation-traction*, TD-24 Superior pipebooms keep handling big loads on boggy ground, without tipping or miring!

EXCLUSIVE: **You get exclusive choice of direct gear drive TD-24 (190 hp) or** torque converter model (200 hp). Also, you have a choice of a top hinge counterweight model (90,000 lb. lift) or a bottom hinge counterweight model (110,000 lb. lift).

On any cross-country pipe-lining spread you put together, these big International TD-24 Superior pipeboom exclusive advantages can tremendously affect your job profit sheet! Compare how new bonus-powered International Superior TD-18, TD-14, and TD-9 pipebooms outperform any other units in their size classes. Why be satisfied with anything less than International Superior performance? See your distributor for a demonstration of the International Superior boom and tow equipment your spread needs!

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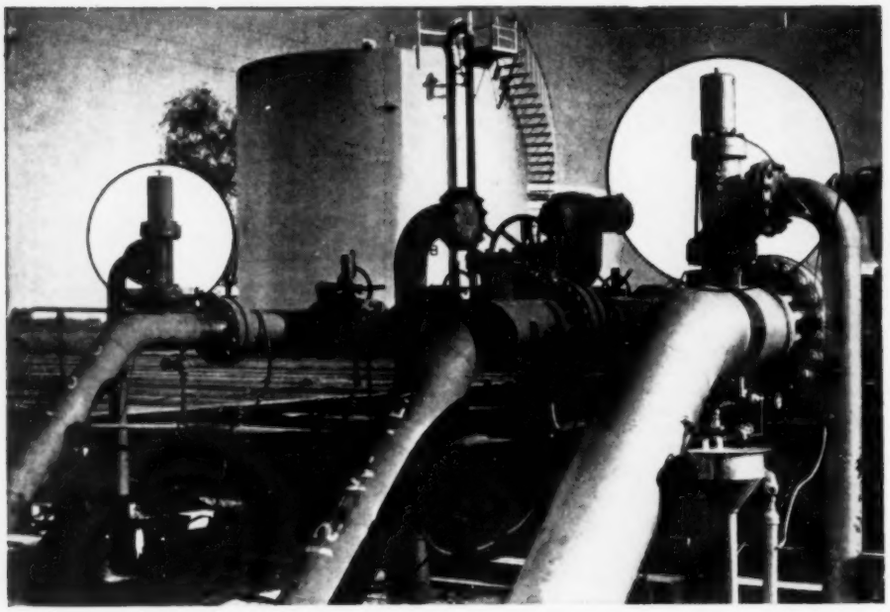
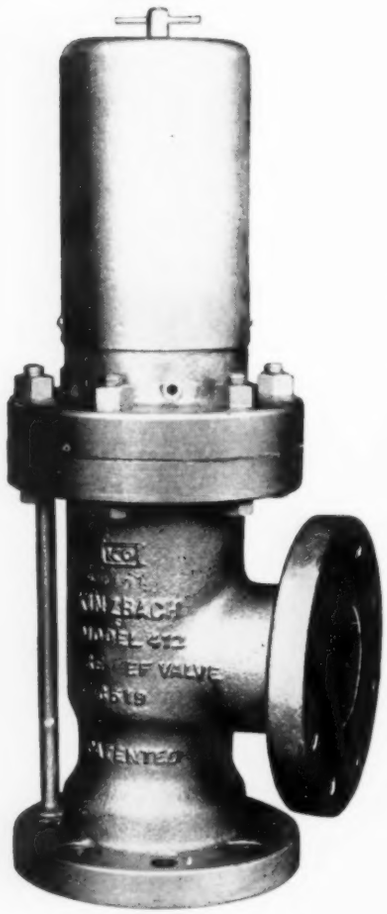
International-Superior®

International Harvester Company, 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE INCLUDING: Crawler, Wheel, and Pipe-Boom Tractors . . . Self-Propelled Scrapers and Bottom-Dumps . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Trucks . . . Diesel and Carbureted Engines . . . Motor Trucks



Positive Protection Against Pressure Surges



KINZBACH
MODEL 412
RELIEF VALVE
for Pipelines and Refineries

When a pressure overload in the line is reached, the Kinzbach Model 412 Relief Valve opens instantly to full capacity. This valve provides automatic resetting at a pre-determined pressure drop, positive seating and facilities for functional testing.

The Model 412 uses line pressure for opening and closing. The opening pressure is preset by application of a dead weight load. Opening and closing action is positive and reliable. The pre-set pressure never changes.

Kinzbach Model 412 Relief Valves are available in 2", 3", 4", 6" and 8" sizes for working pressures up to 1000 p.s.i. Write for Bulletin RV412 for full technical data.

KINZBACH TOOL CO INC

KINZBACH TOOL COMPANY, INC.

P. O. Box 277 Houston, Texas

Export Office: 74 Trinity Place, New York, N. Y.

The Bowl Gazer

United Gas Corporation's C. W. Evans may not be a good crystal ball gazer but he does well with fish bowls. At the recent meeting of the National Association of Corrosion Engineers, the Shreveport man looked at the Crutcher-Rolfs-Cummings Glass Wrap sample-filled fish bowl and came the closest to guessing the correct number of samples. Evans, left, received a wrist watch from Jack Henry of C-R-C for his "bowl gazing."

New Plant Facilities Announced By Corrosion Rectifying Co.

Wayne A. Johnson, president, has announced that the newly expanded facilities of the Corrosion Rectifying Company have been moved. The new address is 5310 Ashbrook, Bellaire, Texas.

Activities include a complete cathodic protection engineering and installation service for the petroleum industry. Recently Corrosion Rectifying developed Electronics International Incorporated to design and manufacture the electronic equipment used in corrosion prevention work. This will provide closer control over the equipment provided with the firm's installations.

Gray to Manage Supply Store For Jones & Laughlin in Illinois

Donald R. Gray has been appointed local manager of Jones & Laughlin Supply Division's supply store at Clay City, Ill. Gray has been with the firm since January 1949.

From that time until February, 1952, he served as a storeman at Salem, Ill., then was transferred to St. Elmo, Ill., where he served as a storeman until his recent promotion.

How to Get Your 1956 Editorial Index

A complete editorial index covering all issues of PIPE LINE INDUSTRY published during 1956 has been compiled and bound separately in convenient pamphlet form. It will be sent free to all subscribers requesting copies.

To get your copy, address orders to the Librarian, Gulf Publishing Company, Post Office Box 2608, Houston 1, Texas. Or if you prefer, you can use the convenient Readers' Service Blue Postcard on the last page of this issue. Just check the square indicated. Fill in your name and address. Drop the postage-paid card in the mail, and the index will be sent you.

Act now. The supply is limited.

Continental Supply Named Distributor

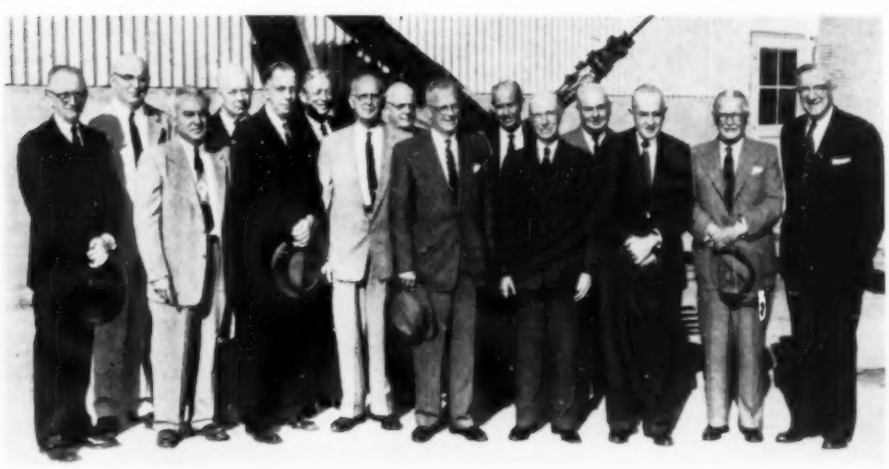
Continental Supply Company has been appointed distributor of Jordan-Rogers PVC plastic pipe. The agreement gives Continental exclusive distributorship of the line of Jordan-Rogers high impact PVC plastic pipe for oil country use in Canada and the U. S., except in the states of California, Oregon and Washington. Looking over the Jordan-Rogers brochure is George Runnels, manager, Pipe Line Equipment division of Continental Supply, and Ted Anderson, newly appointed mid-continent pipe sales manager for Jordan-Rogers.

Henry F. Dever Is Named To Top Post at Honeywell

Henry F. Dever, president of Brown Instruments Division of Minneapolis-Honeywell, has been given corporate responsibility for directing the parent company's activities in the industrial controls field.

Dever will be responsible for the over-all planning in the industrial controls field and will counsel and coordinate the engineering and manufacturing operations of seven M-H divisions now active in the field. Dever will continue to head up the Brown Instruments Division (Philadelphia) and will make his headquarters there. C. L. Peterson, vice president and general manager of the division, will direct its daily operations.

Dever, who has been with Honeywell for 30 years, was vice president of engineering in Minneapolis before moving to Philadelphia to head up the Brown division.



Link-Belt Board Members Visit Plant

Robert C. Becherer, president, and the board of directors of Link-Belt Company of Chicago visited the company's subsidiary, Link-Belt Speeder Corporation, Cedar Rapids, Iowa, recently during the quarterly directors' meeting. Shown above, left to right, are Becherer, president and director of Link-Belt Company; David W. Lehti, president, C. M. Basile, vice president, and Gustaf H. Olson, vice president, all of Link-Belt Speeder Corporation; and the following directors of Link-Belt Company: J. Reece Lewis of Philadelphia, Penn.; Russell B. Livermore and Howard Coonley of New York; George P. Torrence of Atlanta, Ga.; Carl S. Weyandt of Homer City, Penn.; Harris Whittemore, Jr., of Naugatuck, Conn.; Bert A. Gayman of Burlingame, Calif.; and the following all of Chicago: Richard F. Bergmann, Harold L. Hoefman, Alfred Kauffmann and Harry E. Kellogg. David E. Davidson of Chicago was not present.

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FOR SALE VERY CHEAP

Bulldozers, Angle & Straight, Cable Controls & Hydraulic Attachments.

Wrecking Now — Following Tractors For Parts:

Caterpillars: D-2, D-4, D-6, D-7 and D-8
Allis-Chalmers: HD-7, HD-10, HD-14, L & S
Internationals: TD-9, TD-14, TD-18
Cletracs: All Models

We now have operating latest type automatic track, roller and idler rebuilding equipment. We can furnish rebuilt tracks, rollers and idlers at lowest prices. Bring or send your old track, rollers and idlers for credit on exchange. Also can rebuild yours, at greater savings – Fully guaranteed – Quality workmanship.

Also Parts and Tires for Allis-Chalmers, Caterpillar, Adams, Motor Graders.

WE TRADE – WE BUY – WE SELL
1956 Catalog Now Ready
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2745 Main Ave. – Phone 5-9511, 2-8312
FARGO, NORTH DAKOTA

25 8" Nordstrom 600# round port Hyperseal plug valves. Fig. 16559. Specially priced. This is typical of the many unusual items in our stock. Jackson-Markus Supply Company, 3612 E. 26th Street, Los Angeles, California.

FOR SALE CHEAP—1 TD 14 International tractor with hydraulic angle dozer and side boom in good running order—price $5500.00 delivered within 1500 miles; or will trade for any old tractors.
SURPLUS TRACTOR PARTS CORPORATION
2745 Main Avenue, Fargo, North Dakota
Phone 28312

TRY A CLASSIFIED AD IN PIPE LINE INDUSTRY

Idle Equipment –
Idle Dollars!
Sell It Through a Classified Ad in Pipe Line Industry.

QUICK ECONOMICAL RESULTFUL

Need Engineers – Technical Personnel? A Classified Ad will get them for you.

What's New in Equipment

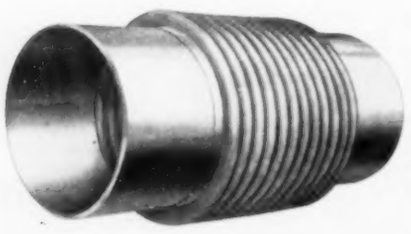
for the Pipe Line Industry

Tapping Machine

A high pressure, high temperature tapping machine has been used by T. D. Williamson, Inc., engineers in a laboratory experiment to cut a 36-inch coupon from a pipe line. The coupon is shown in the photograph retained inside the giant cutter.

The machine used in the tap is employed throughout the pipe line industry for making connections to pipe lines and tanks without shutdown or leakage in conjunction with special stopple plugging machines for making repairs and additions to piping without shutdown. This is the first machine to perform a tap of 36-inch dimensions.

For mode data, circle **No. E1** on Readers' Service Card, last page this issue.



Expansion Joints

Badger Manufacturing Company is offering a redesigned line of packless corrugated expansion joints for use in power, heating, industrial and process piping applications.

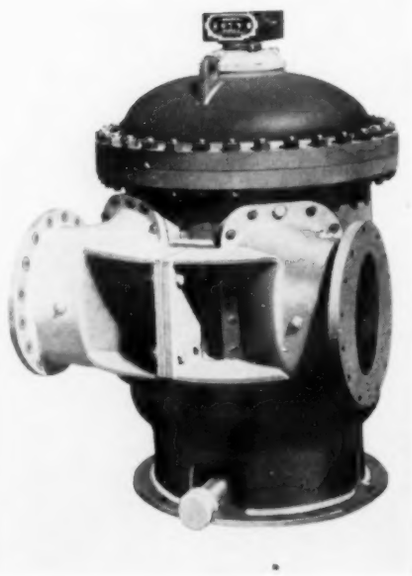
The Badger service-rated expansion joints are available in several types which are classified in series according to the pressure-temperature conditions to be encountered in much the same way that pipe flanges are rated by the ASA.

Most notable of design changes is found in the shape of the corrugations which form the flexing member. The new shape gives each corrugation a more effective height which results in flexibility and more uniform movement per corrugation than conventional types of expansion joints.

Fabricated from wrought steel, the new reinforcing rings are substantially lighter and are able to withstand higher pressures and temperatures than conventional cast iron types.

All service-rated joints are available in any weldable alloy including stainless steel, Monel, Inconel and nickel for pipe diameters from 3-inch to 72-inch. Normally they are equipped with internal liners to streamline the flow through the joint for minimizing turbulence and the high frequency vibrations that result.

For more data, circle **No. E2** on Readers' Service Card, last page this issue.



Displacement Meter

A. O. Smith Corporation's Meter Products division has manufactured a rotary positive displacement petroleum meter with a capacity of 10,000 barrels per hour. The model B-700 meter is designed to speed tanker loading, line flow rate and other large capacity streams requiring precise measurement.

The meter is temperature compensated and equipped with gravity selection. It utilizes a 16-inch dual case. The B-700 currently is being tested at an oil field pipe line terminal.

(This item supplements A. O. Smith Corp., Meter Division, data in the Composite Catalog, 21st Edition, page 4649.)

For more data, circle **No. E3** on Readers' Service Card, last page this issue.

Unitized Autronic Controls

A new line of unitized autronic controls is announced by The Swartwout Company. The new instruments are based on the Autronic principle of instantaneous, all-electronic control.

Unitizing of autronic controls has resulted in a number of advantages over other systems. Among these are: controller, recorder (or indicator) and manual control are of plug-in construction; any combination of units is contained within a universal mounting case requiring a single standard panel cutout of only 5 by 5 inches; wiring between individual instruments has been eliminated; instruments can be easily pulled out of panel for calibration, test or maintenance without employing "jumpers" and without upsetting system balance.

Since units are of the plug-in type, two or more functions can be combined in a universal mounting case. Hence, a typical unit might consist of a single mounting case enclosing an autronic recorder. To this can be added a manual control in the same case and visible through the same panel cutout. In addition, a controller can be plugged into the back of the mounting case.

For more data, circle **No. E4** on Readers' Service Card, last page this issue.

ALLIS-CHALMERS ADVANCED DESIGN CRAWLERS

turn waste time into work time

You get *extra* money-making *work time* with an Allis-Chalmers crawler tractor on every pipeline job—dozing, side booming, winching, towing, pushing. Built for today's jobs, these crawlers are wheeling out more work in less time than comparable size machines.

Look at the facts

1,000-hour lubrication intervals save lube time

Allis-Chalmers tractors start the day with *go*—not greasing. You can operate six months on a 40-hour week basis with just one lubrication of truck wheels, front idlers and support rollers. Designed with Positive Seals and tapered roller bearings, these units are protected from dust, loose sand, soft ground, mud or water. You not only gain *working time*, but save labor and lubricant costs as well. And there's no costly damage from greasing neglect.

Modern shift pattern speeds digging

Here's a big timesaver on right-of-way clearing. It takes just half the time and effort to change from low forward to fast reverse with the Allis-Chalmers HD-6, HD-11, or HD-16 transmission. One simple shift of the gear lever does the job. You gain production time—up to 25 percent on actual test—on bulldozing, backfilling and other jobs calling for a short forward-backward cycle.

Unit construction cuts servicing time

No need to remove transmission or engine, radiator, grille, when servicing or removing an Allis-Chalmers master clutch. This unit can be removed without disturbing adjacent parts. This is also true of other main assemblies—final drive gear, transmission, steering clutches, engine and truck frame. You can quickly substitute an assembly and put the tractor to work while servicing the original unit. As a result, hours of *costly service and downtime are saved* because of Allis-Chalmers advanced design.

These are just three examples of Allis-Chalmers timesaving, money-making features. Your Allis-Chalmers dealer can point out many more. See him now for the full story.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

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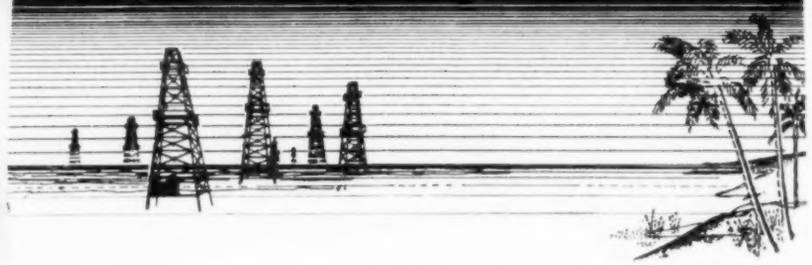
PIPE LINE TRENCHING

16 60 Model Trencher digging in hard sand

in the **MIDDLE EAST**



Engineers in oil-producing countries know the best machines for the job. For trenching, they specify ALLEN—a name renowned for reliability, freedom from costly breakdowns, and ease of maintenance. In hot, dusty conditions, ALLEN trenchers slog on, day in, day out, standing up to years of continuous hard work—they have no equal anywhere.

Three models are available, the 12 21, the 16 60, and the new 14 30 for medium size trenches.

ALLEN TRENCHERS

Illustrated catalogues and technical data on request.

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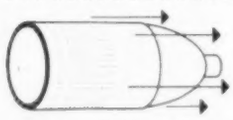
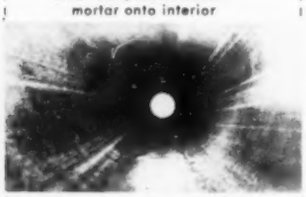


Liner compresses cement mortar onto interior



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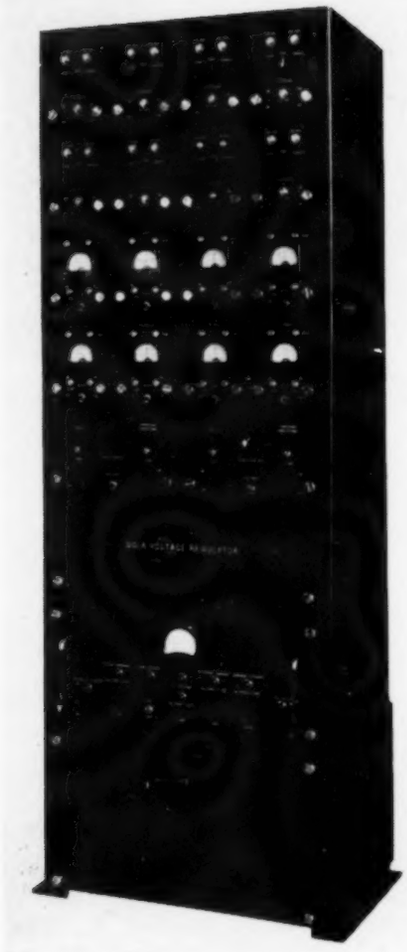


Measuring System

The Indikon Company is manufacturing packaged protective and measuring systems for oil and gas pipe lines and the chemical industry. These include individual plug-in electronic units for temperature, pressure, and vibration alarm and shut-down functions, pressure measurement and telemetering. Associated sensing elements include resistance bulbs, strain gage pressure cells, magnetic vibration pickups. Pressures are displayed on long scale meters. The systems are easily installed and have low maintenance.

For more data, circle **No. E5** on Readers' Service Card, last page this issue.

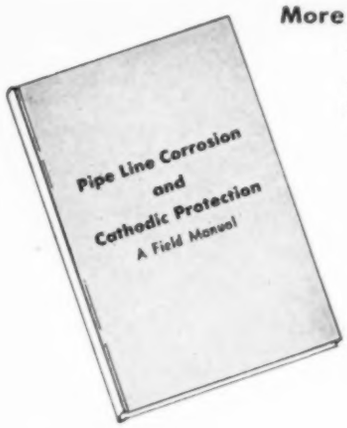
Iron Powder Electrode

A new iron powder electrode, Airco Easyarc 10, is now available from Air Reduction Sales Company. It is the first iron powder electrode developed to meet requirements of the AWS-E-6010 classification.

Using normal techniques and normal arc length, Easyarc 10 provides a shallow rippled, smooth weld deposit in all positions including vertical down.

It is suitable for many applications such as tanks with plain or galvanized surfaces, field construction, shipyards, and in particular, areas where out of position welding is encountered.

For more data, circle **No. E6** on Readers' Service Card, last page this issue.



More comments on this new Handbook:

"... a most practical on-the-job manual for men concerned with pipe line corrosion. We are ordering copies for each of our district engineers."

Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This Handbook, written by Marshall E. Parker, consultant, is designed as a practical field manual. It is a 108-page pocket-size volume printed first as a popular series in WORLD OIL. The Handbook is illustrated with many charts and drawings and is completely indexed by subjects.

It presents comprehensive data on Soil Resistivity Surveys, Potential Surveys, Line Currents, Current Requirements, Rectifier Systems, Ground Bed Design, Magnesium Anodes, Stray Current Electrolysis, Interference in Protective Systems, Operations and Maintenance, and Coating Protection and Testing.

An appendix has been added of technical data on Underground Corrosion, Basic Principles of Cathodic Protection, Properties of Metals and Attenuation Equations. Order copies of this practical Field Manual now for each of your field men. Price $3.

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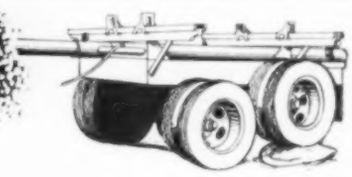

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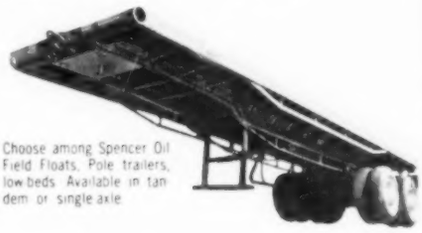

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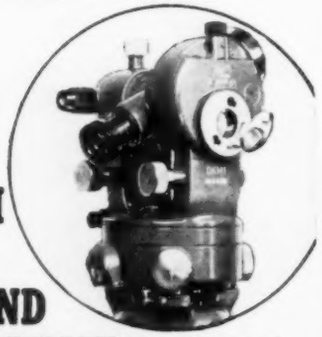

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Excavator Crane

A new redesigned truck incorporating the Clark power train is featured in the Michigan Model T-20 excavator-crane introduced by the Construction Machinery division of Clark Equipment Company.

The truck has a gross vehicle weight of 42,300 pounds with full crane equipment and can be reduced to 37,600 pounds for highway travel by removing rear outriggers, crane boom and counterweights. For steel erection, the T-20's maximum boom length is now 80 feet with jib booms 10-15 feet in length.

The truck power train consists of a five-speed transmission, a two-speed transfer case and planetary wheel driving axles, all Clark-designed and built. With a 134-hp gasoline chassis engine, the maximum travel speed is 35 miles per hour. Hydraulic steering booster and all-wheel air brakes provide ease and safety of operation.

All-wheel 6-by-6 drive is standard equipment. Riding qualities have been improved through redesigned front axle overload springs. The truck chassis is of all-welded construction with 18-inch by 58-pound Man-ten steel channel frame rails.

Extension of the hood flush with the right forward side of the truck has made the maintenance of the chassis engine easier. A large side access door permits entry to the engine compartment even when the boom is extended forward in the carry position.

For more data, circle **No. E7** on Readers' Service Card, last page this issue.

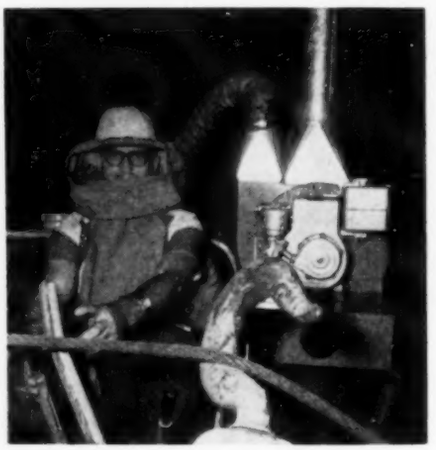
Dust Shield

A dust-shielding device to insure safety and efficiency in the operation of pipe line equipment has been devised by Jim Cummings of Crutcher-Rolfs-Cummings, Inc.

Called the "Dust Hood," the equipment is designed for protection of tractor drivers, dope machine operators and ditcher crews.

The complete unit consists of a 1½ horsepower gasoline engine, two screen filters, an air tube and an open windowed helmet. Clean air above the "dust line" of right-of-ways is pulled into a tall stack, sent through the filters and the air tube and finally forced out the window of the helmet in a jet of clean air.

The apparatus will allow normal breathing at all times and does not hamper the operator's vision. The hood is lightweight and may be attached to any machine.



For more data, circle **No. E8** on Readers' Service Card, last page this issue.

Backhoe

Production of a truck-mounted Davis backhoe in the price range of a tractor-mounted backhoe has been announced by Mid-Western Industries, Inc. The unit will fold and retract on a truck bed for compact transporting. It can be removed from the truck in less than five minutes.

The new Davis product will fit any one-ton or larger flat bed truck with no modification of the truck bed. Easily installed or removed, it provides backhoe service for a truck and still permits the truck to be used for other purposes without the backhoe.

The basic backhoe frame fits onto a truck attaching kit that has retractable runners which are actuated by a hydraulic ram so that the unit can be loaded or unloaded from the truck with a hydraulic valve. It can be removed from the truck in less than five minutes, leaving the truck bed completely free of any equipment. This frees the truck to move out for other work and allows the backhoe to remain in position for quick attaching when the truck backs in.

The backhoe moves from the transport position to the digging position in one minute. In operation the backhoe stabilizer feet absorb the wear and tear with the truck serving as a counterweight.

The basic backhoe can be either the standard Model 185 Davis backhoe or the new Model 210 which is equipped with a new type of rotary hydraulic cylinder that permits a 200-degree continuous operating arc without changing a pin and without use of cables.

For more data, circle **No. E9** on Readers' Service Card, last page this issue.

THE day you begin coating and laying your pipeline is the day you write your own ticket on future maintenance costs.

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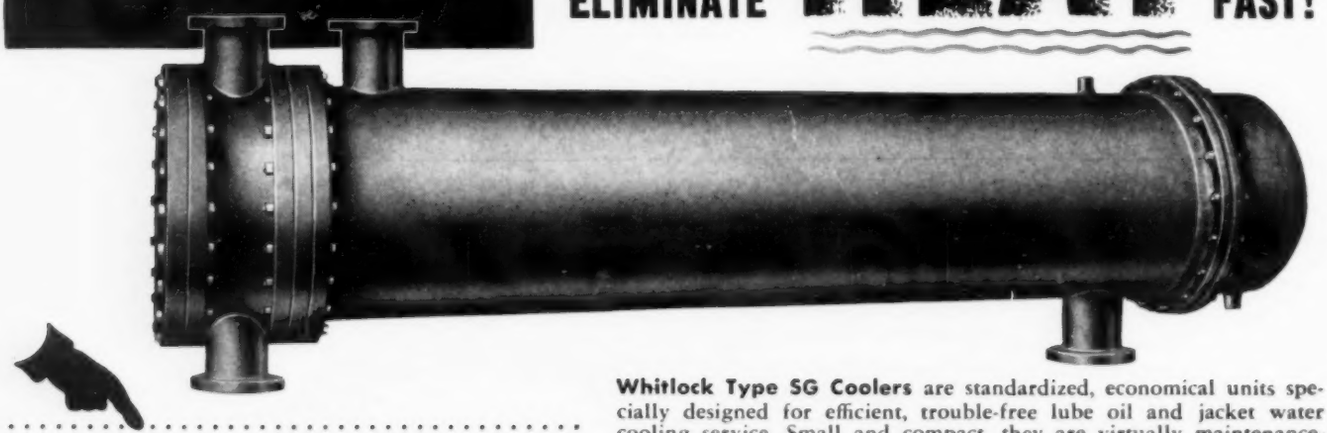

Whitlock Type SG Coolers are standardized, economical units specially designed for efficient, trouble-free lube oil and jacket water cooling service. Small and compact, they are virtually maintenance-free and give dependable operation even when in continuous service, handling high heat loads. The materials of construction — non ferrous tube bundle, cast iron channel and steel pipe shell — mean long, trouble-free equipment life. The Type SG Cooler is widely used in the small standard sizes but larger units to fit individual requirements are available when required. Fill in and return the coupon today for Bulletin 122 which will give you the whole story.

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New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers Index. Simply circle code numbers of items desired—sign and mail card.

Lifting Crane

A new catalog is available describing The Thew Shovel Company's new 35-ton Lorain Moto-Crane, model MC-530W. New features of this heavy-duty lifting crane which is transportable over the highways are described. New developments offered as standard equipment include the "Shear-Ball" mounting eliminating all turntable rollers, center pins and centering gudgeons with constant maintenance and adjustment; a 35-foot pin-connected boom of alloy steel of the new Lorain square-tubular-main-chord design for increased lifting capacities, longer ranges at reduced weight, a 3-position turntable mounting for maximum efficiency when used as a heavy-duty crane, general purpose crane or for shovel, hoe and dragline service.

To get a copy, circle **No. E10** on Readers' Service Card, last page this issue.

Industrial Meter

A newly-revised edition of Rockwell Manufacturing Company's ER industrial meter bulletin offers additional information on factors affecting meter selection to enable single-plant operators to be self-sufficient in ordering. Included in the new bulletin is more complete temperature, viscosity, pressure and registration data along with additional illustrations, an explanation of various metering terms and ordering instructions.

To get a copy, circle **No. E11** on Readers' Service Card, last page this issue.

Chemical Proportioning Pump

The new model 1140 Proportioneer is described in a bulletin prepared by the manufacturer, Proportioneers, Inc., division of B-I-F Industries, Inc. This bulletin contains photos, capacity charts and dimension drawings with applicable text showing how the Model 1140, either in the simplex or duplex style, is suited for proportioning (in chemical and/or general industrial fluid applications) over a wide range of capacities and pressures.

To get a copy, circle **No. E12** on Readers' Service Card, last page this issue.

Pipeliner Machine

Insley Manufacturing Corporation has issued a two-color folder describing the new model Insley pipeliner machine. Photographs of the machine at work, working range diagrams, lifting capacity ratings and specification data are included.

To get a copy, circle **No. E13** on Readers' Service Card, last page this issue.

Insulation Tape

Techniques for protecting underground pipe from corrosion with "Scotchrap" brand pipe insulation tape is the subject of a new booklet presented by Minnesota Mining and Manufacturing Company.

Step-by-step photographs and instructions for wrapping bends, elbows and short sections, patching pipe with tape, preparing joint surfaces for wrapping, wrapping welded joints and taping straight pipe sections are included. An additional section contains a summary of suggestions for making pipe protection with tape easy.

To get a copy, circle **No. E14** on Readers' Service Card, last page this issue.

Backfiller

The Cleveland Trencher Co. has issued a new folder on the Cleveland 80W, three-way machine for the construction and utilities fields. The one-man-operated 80W is also usable as a pipe layer and sidecrane with a 30,000 foot-pound capacity. The bulletin shows how the design and construction features are used under a wide variety of operating conditions in sidecrane, backfilling and tamping work. Twenty-eight on-the-job action photographs demonstrate the operations of the 80W.

To get a copy, circle **No. E15** on Readers' Service Card, last page this issue.

Handwheel Operator

The "Cono-Clutch" handwheel operator is available from Conoflow Corporation as an integrally mounted accessory for the company's standard line of cylinder conomotor actuators. The cylinder conomotor, a pneumatically positioned power actuator, has found wide industrial application for throttling control on numerous types of valves, motor driven speed changers, proportioning pumps, flow regulators, rheostats, etc. A new bulletin describes the "Cono-Clutch" hand operator as an accessory for Conoflow Series LB control valves.

To get a copy, circle **No. E16** on Readers' Service Card, last page this issue.

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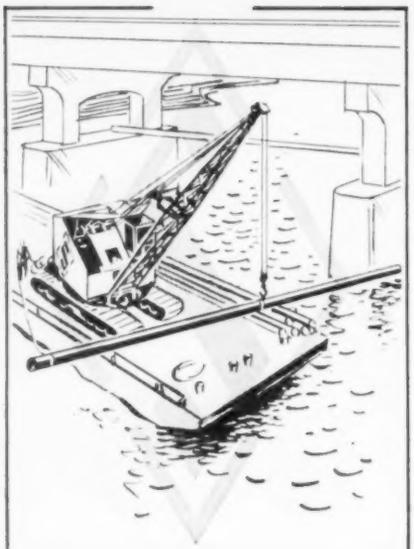

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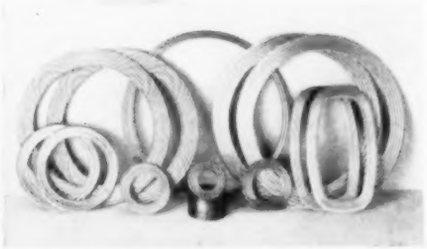

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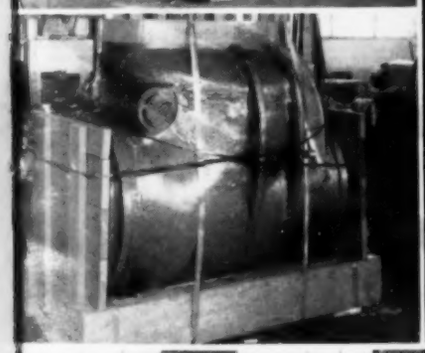

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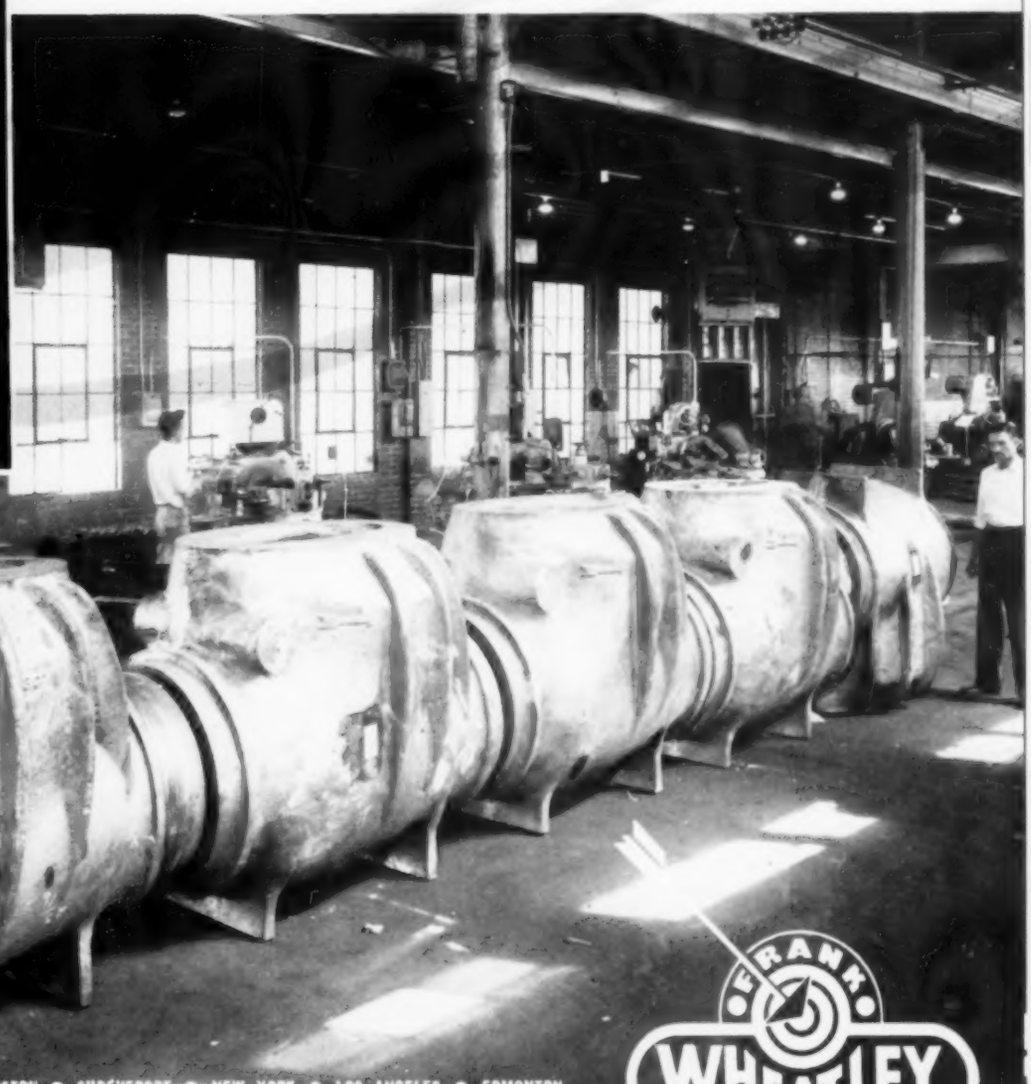

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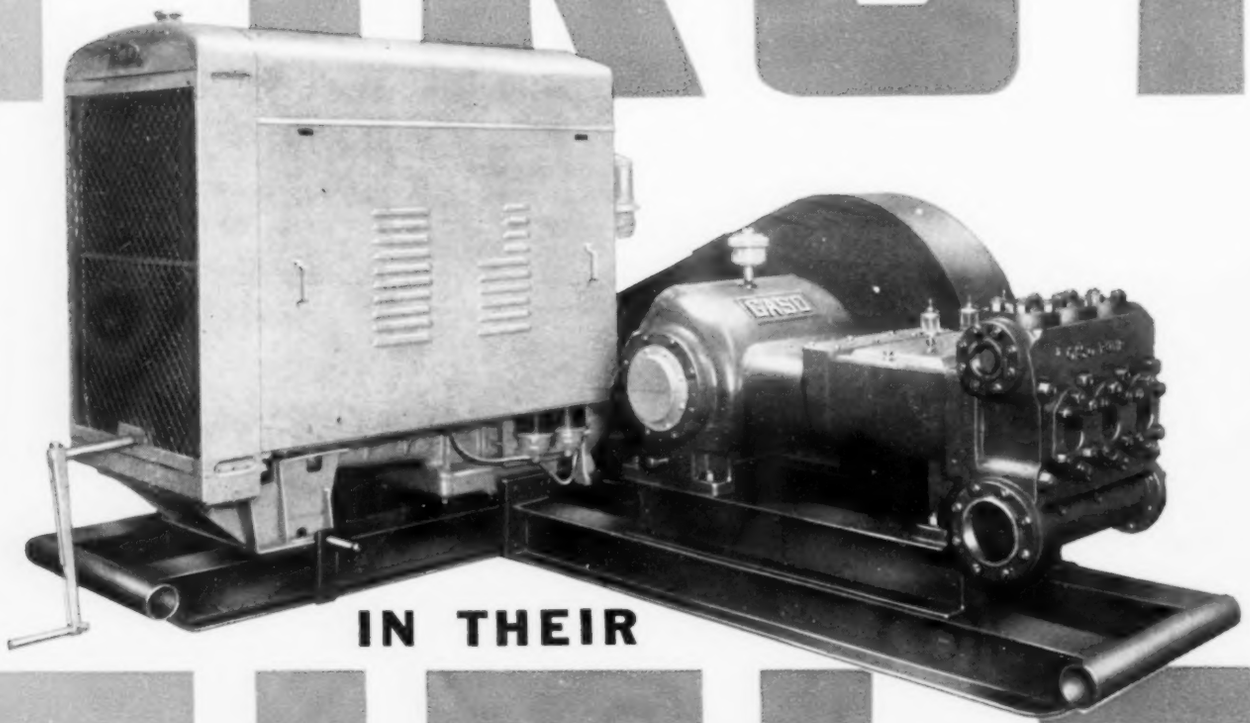

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